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. 6 June 1955 No. 6

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METEOROLOGICAL ABSTRACTS AND BIBLIOGRAPHY

MALCOLM RIGBY, Editor

Vol. 6 JUNE, 1955 No. 6

SPECIAL FEATURES IN THIS ISSUE

An Annotated Bibliography on Cloud Physics

by
Geza Thuronyi and Mary L. Rice

(*For complete table of contents see back cover*)

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EXPLANATIONS

Location of material: For each entry, a symbol is given for at least one library where the material may be found. The Union List of Serials (Gregory) is the source of most of the symbols used. In some cases, where no symbol has been assigned to a library, one will be devised according to the principles of the Union List.

Library symbols used frequently may be found in the following list:

DA:	U. S. Dept. of Agriculture Library, Washington, D. C.
DBS:	U. S. Bureau of Standards Library, Washington, D. C.
DGS:	U. S. Geological Survey Library, Washington, D. C.
DLC:	Library of Congress, Washington, D. C.
DN-HO:	U. S. Navy Hydrographic Office Library, Suitland, Md.
DSG:	U. S. Army Medical Library, Washington, D. C.
DSI:	Smithsonian Institution Library, Washington, D. C.
DWB:	U. S. Weather Bureau Library, Washington, D. C.
GB-MO:	Great Britain, Meteorological Office Library, Harrow, England.
MH-BH:	Harvard University, Blue Hill Observatory (and American Meteorological Society) Library, Milton, Mass.

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*	before an entry indicates a good data source.
†	before an entry indicates a good bibliography.
§	before an entry indicates a synoptic case history study accompanied by charts.

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Titles of articles or monographs are in the language of the original article unless otherwise stated. Slavic (Cyrillic) titles are transliterated into the Roman alphabet according to the Library of Congress transliteration scheme.

Abbreviations:

Titles of periodicals are not abbreviated, as a rule.

The months of the year from March to July are not abbreviated. Other months are abbreviated as Jan., Feb., Aug., Sept., Oct., Nov., and Dec.

The word or abbreviation for Volume (Tom, Band, Jahrgang, Año, etc.), for Number (Heft, Fascicule, Vypusk, etc.) and for page or pages is omitted from most entries. Thus an entry will read as follows:

Meteorologische Rundschau, 2(5/6):146–151, May/June 1950.

This indicates that the article appeared in *Meteorologische Rundschau, Jahrgang* 2 (Vol. 2), *Heft* 5/6 (No. 5/6), *pages* 146–151, May/June 1950.

PART I. ABSTRACTS OF CURRENT METEOROLOGICAL MATERIAL

GENERAL AND SPECIAL

COLLECTED WORKS AND TEXTBOOKS

6.6–1 551.5:621.39(08)

*†Jackson, Willis (*ed.*), **Communication theory. Papers read at a Symposium on "Applications of Communication Theory," held at the Institution of Electrical Engineers, London, Sept. 22–26, 1952.** London, Butterworth, **1953.** 532 p. figs., tables, refs., eqs. **DWB**—The book consists of 40 articles on communication theory of experts in all phases of this new and important field. Among the subjects treated are coding, feedback mechanics, noise and transmission through noise by telegraph, radio, radar or television, storage time, propagation time, relaxation filters, transmission of drawings, color television transmission, hearing, information in words or speech, telephone circuits, communication rate, semantic communications and application to optics. The possible applications to various phases of meteorological practice are too numerous to mention. The theory is applicable, for instance, in telecommunication, radar and TV observation, coding of reports, teletransmission of automatic recording instruments, radiosonde work and even library and bibliographic work. *Subject Headings:* **1. Communication theory 2. Telecommunication 3. Radar observation 4. Textbooks 5. Compendiums. I. Institution of Electrical Engineers. Symposium on Applications of Communication Theory, Sept. 22–26, 1952.**—*M.R.*

6.6–2 551.5(02)

Fenton, Carroll Lane and Fenton, Mildred Adams, **Our changing weather.** Garden City, N. Y., Doubleday, **1954.** 110 p. diagrs., illus. **DLC**—A popular illustrated book for juveniles. Chapters on causes of weather, air, light, heat, wind (general and local), effect of sea and land, clouds, fog, rain, snow, dew, frost, air masses, storms, cyclones, weather maps and forecasts are lavishly illustrated with well chosen and vivid photographs and schematic diagrams. *Subject Headings:* **1. Elementary meteorology 2. Juvenile literature.**—*M.R.*

6.6–3 551.510.535:551.594.12:523.8

†Massey, Harrie Stewart Wilson (*Univ. of London*), **Negative ions.** 2nd ed. Cambridge, Univ. Press, **1950.** 136 p. 31 figs., bibliog. p. 130–133. *Cambridge Monographs on Physics.* **DLC**—Book discusses all types and methods of formation of negative ions, dissociation and recombination processes, and in the final chapter, **Negative ions in glow discharge** (p. 101–130), the processes in the upper atmosphere which are associated with ionization; also negative ions in stellar atmospheres, formation, height variations, diurnal changes, concentrations of ions and electrons, night sky emissions. *Subject Headings:* **1. Negative ions 2. Ionospheric processes 3. Ionization in stellar atmospheres.**—*M.R.*

6.6–4 551.510.535:541.12(02)

Massey, Harrie Stewart Wilson and Burhop, E. H. S. (*both Univ. of London*), **Electronic and ionic impact phenomena.** Oxford, Clarendon Press, **1952.** 669 p. 286 figs., tables, refs., eqs. *International Series of Monographs on Physics,* Oxford. **DLC**—The most exhaustive treatment of every aspect of collision phenomena, including dissociation and recombination such as takes places in the ionosphere or chemosphere (p. 641–646). The major parts of the book cover: I. Passage of electrons through gases; II. Experimental analysis; III. Electron collisions with atoms—theory, IV. Electron collision with molecules; V. Reflection and secondary emission from surfaces due to electron bombardment; VI. Electron collisions

between atoms—involving emission of radiation; VII. Collisions between atoms—mobility of ions in gases; VIII. Passage of beams of positive ions or neutral atoms through gases; IX. Collision of ions and atoms with surfaces and X. Recombination. Appendix covers recent advances. *Subject Headings:* **1. Electron collision theory 2. Ionic impact phenomena 3. Recombination in ionosphere 4. Dissociation in atmosphere 5. Textbooks.**—*M.R.*

6.6–5 620.92:539.1(02)

Massey, Harrie Stewart Wilson, **Atoms and energy.** London, Elek Books, **1953.** 174 p. 37 figs., 6 tables. *Science in Action*, London. **DLC**—Cosmic rays and particles are treated in Part I of Ch. 6, **Present day research in pure atomic physics** (p. 142–168). Kappa, Mu, Pi, Tau and Vee mesons, artificial cosmic rays, etc. are described and explained. Other aspects of atomic physics, including history of major discoveries, are treated in other chapters in a simple but accurate manner. *Subject Headings:* **1. Atomic energy 2. Cosmic radiation 3. Mesons 4. Textbooks.**—*M.R.*

6.6–6 551.5:012

†Van Everdingen, Ewoud, **C. H. D. Buys Ballot, 1817–1890.** 's-Gravenhage, D. A. Daamen, **1953.** 222 p. port., foot-refs. Bibliog. (236 titles) of Buys Ballot's works, in chronological order, p. 93–109. *Nederlanders van de Negentiende Eeuw*, s'-Gravenhage. **DLC**—A detailed account of the life and works of this, one of the most famous of 19th century meteorologists, beginning with his ancestry, youth, student years, professorship at Utrecht University, organizer of the KNMI, publications in numerous journals, organizational and scientific work, and his old age. He was born in 1817 and died in 1890. In the appendix there is a list of about 50 honors or societies he was a member of, a 9 stanza poem on the Netherlands participation in the 1st International Polar Year 1882–1883, official correspondence with the Minister of Interior and of Marine regarding KNMI and International Marine Organization 1852–54, excerpts from scientific works and a bibliography of 236 titles dating from 1842–1890. *Subject Headings:* **1. Buys Ballot, C. H. D. 2. Bibliography of C. H. D. Buys Ballot 3. Netherlands. (K) Meteorologisch Instituut 4. Bibliographies 5. Netherlands. I. Buys Ballot, Christopher Hendrick Dirk.**—*M.R.*

IMPORTANT MONOGRAPHS AND REVIEWS

6.6–7 551.521.64 523.4:629.1(05)

Astronautica Acta. Vienna, Vol. 1, No. 1, **1955.** Quarterly. Official journal of the International Astronautical Federation. Pub. by Springer Verlag, Mölkerbastei 5, Vienna 1. Price: annual, DM 36.—; $8.60; sfr. 37.20, from publisher. Editor-in-chief, F. Hecht (Vienna). Title-page in German, English and French. Text in German or English. v. 1, no. 1, has 60 p. includes numerous refs., eqs.; also figs., photos, tables. **DWB**—The first issue of a new journal devoted to physical, technological and physiological problems of space ships, satellites and high atmosphere research, indicates that the quality of the material will be of the highest order. The editorial board is imposing, consisting of well known scientists in Germany, Switzerland, England, Greece, Argentina, France, Austria, Australia and the United States. Articles will be in several languages. Subject matter of the first issues comprises rocket dynamics, cosmic rays, meteorite dissipation, rocket propulsion, artificial satellite mechanics, protection of humans against cosmic rays, etc. Authors include WERNER VON BRAUN, E. SÄNGER, H. J. SCHAEFER and others. *Subject Headings:* **1. Astronautics periodicals 2. Cosmic ray research 3. Serial publications. I. International Astronautics Federation II. Hecht, F.** (*ed.*).—*M.R.*

6.6–8 550.38

†Runcorn, S. K., **Recent progress in the theory of the main geomagnetic field.** *Science Progress*, 43(169):13–27, Jan. **1955.** 23 refs. **DWB**—Deductive and inductive approaches to problems of the origin of the geomagnetic field are described. The significance of secular variation in relation to the semiconducting lower rock mantle and the length of the day is discussed. Reversals of polarity every few hundred thousand years cannot yet be explained. *Subject Heading:* **1. Terrestrial magnetism.**—*C.E.P.B.*

6.6–9 551.575

*†Nurminen, Aili, **A study of fog with special reference to southern Finland.** Helsinki, **1950.** 146 p. 79 figs., 57 tables, 134 refs. **DLC**—A comprehensive analysis of the climatology of fog in Southern Finland on the basis of data from Helsinki (1937–1948), Ilmola and other airfields. The discussion covers the following: formation and physical characteristics and structure of fog, annual, monthly and diurnal distribution of fog, the effect of various meteorological elements such as atmospheric pressure, temperature, radiation, surface pressure and velocity, turbulence, etc. upon fog formation and the effect of meteorological factors at upper levels such as air currents, temperature and pressure fields, etc. on the upper atmosphere. Detailed description of the principal types of fog in southern Finland are given. Statistical and graphical data, and isolines of fog occurrence are included. *Subject Headings:* **1. Fog studies 2. Fog formation 3. Fog frequencies 4. Finland.**—*I.L.D.*

6.6–10 551.508.27

Kramer, C.; Post, J. J. and Woudenberg, J. P. M., **Nauwkeurigheid en trouwbaarheid van temperatuuren vochtigheidsbepalingen in buitenlucht met behulp van kwikthermometers.** [Precision and reliability of open-air temperature and humidity measurements with mercury thermometers.] *Netherlands. Meteorologisch Instituut, Mededelingen en Verhandelingen, Ser. A*, No. 60, **1954.** 60 p. 11 figs. (incl. photos), 14 tables, 20 refs., eqs. Price: F 3.50. **DWB**—Various types of shelters for thermometers and psychrometers (large and small) are tested to determine accuracy of temperature and humidity readings which might affect micrometeorological records. The large shelter was found to give a too-high reading and the small type has defects too. Comparative data in tabular and graphic form and detailed statistical analysis thereof as well as pictures of the equipment and theoretical considerations are presented in an orderly manner in this monograph. Many factors affecting accuracy of psychrometer readings are considered (cloud, wind, radiation, warmth of observer's body, scale readings and tables for reduction of readings). *Subject Headings:* **1. Thermometer shelters 2. Psychrometer accuracy 3. Micrometeorological measurements.**—*M.R.*

6.6–11 551.508.77:551.508.824(98)

†Hiser, H. W. and Huff, F. A., **Precipitation measurements study.** Illinois. State Survey Div. (Meteorologic Laboratory), Contract DA-36-039-SC-15484, Project DA 3-36-02-042, Project SC 794C-0, Final Report, Feb. 15, 1952–Feb. 15, **1954.** 76 p. 20 figs. (incl. photos.), 67 refs. **DWB**—A remarkably thorough study, comprising an evaluation of existing types of rain, snow and dust measuring or detecting devices and recommendations for most practicable type to be used in automatic weather stations in the Arctic under specified rigid conditions. The U. S. Bureau of Reclamation radio-reporting precipitation gage, the Guyton electronic particle counter or the Smith and Carlisle photo-electric dust meter for dust and a precipitation detector developed under this contract are recommended for adaptation to the automatic weather stations. Excellent photos and drawings of instruments and circuits of various types, and a bibliography of 67 references to literature on dust measurement, add to the value of this report. *Subject Headings:* **1. Precipitation gages 2. Automatic weather stations. 3. Dust measuring equipment 4. Dust measurement bibliographies 5. Arctic weather stations.**—*M.R.*

6.6–12 551.509.33

*Grapper, Roger (*French Met. Service*), **La prévision à moyenne et longue échéance par les singularités de pression utilisées synoptiquement.** [Medium and long range forecasting on the basis of pressure singularities used synoptically.] *France. Météorologie Nationale, Mémorial*, No. 38, **1953.** 78 p. 14 figs., 3 graphs (some fold.). **DWB**—In this elaborate statistical "memoir" the author analyzes the pressure records for Paris for 1874–1949, and shows that there are a number of real singularities in the annual course of mean pressure or frequency of intense cyclones or anticyclones, whether taken on a day-to-day or a 5-day mean basis, which enables extended forecasts to be made with a greater degree of objectivity than heretofore. These singularities are shown to correspond with those at Kew, Uccle and Strasbourg and are based on anomalous frequency of air masses for various sources on certain dates. These dates and events correspond with those given in a table of popular weather

proverbs. Intercorrelation between events is shown graphically. The conclusion is that this study and a similar one by C. E. P. BROOKS (1946) establish "beyond a shadow of a doubt" the reality of these singularities and their usefulness in forecasting. *Subject Headings:* **1. Pressure singularities 2. Extended forecasting 3. Statistical forecasting 4. Singularities 5. France.**—*M.R.*

6.6–13 551.524.7(691,267) 551.571.7(691,267)

*Emon, Jean (*French Met. Service*), **Température et humidité en altitude dans l'Océan Indien Sud-Ouest.** [Temperature and humidity in the upper air over the southwest Indian Ocean.] *France. Météorologie Nationale, Mémorial,* No. 39, **1954.** 143 p. 33 tables, 36+charts, bibliog. p. 121. **DWB**—A nicely organized and printed monograph giving data and an analysis thereof for upper air temperature, temperature gradient and relative humidity at Diego-Suarez and Tuléar, Madagascar, and Plaisance-Maurice for 1943–45, based on morning and afternoon British airplane soundings from 500 m to 7000 m. A seasonal reversal of temperature and humidity is found at the higher levels. Diurnal variations are almost nil at 2–5 km. Conditions of observations and compilation of data are explained in detail. Vapor pressure, specific humidity, dew point, wet bulb, wet bulb potential and potential temperature data are derived and discussed. Diurnal, seasonal and regional variations in all elements and relation to trade winds are discussed. Temperature and humidity isopleths and average soundings are appended. *Subject Headings:* **1. Upper air temperature data 2. Upper air humidity data 3. Madagascar 4. Indian Ocean.**—*M.R.*

6.6–14 551.584 551.524:551.511

Businger, J. A., **Some aspects of the influence of the earth's surface on the atmosphere.** *Netherlands. Meteorologisch Instituut, Mededelingen en Verhandelingen, Ser. A,* No. 61, **1954.** 78 p. figs., table, refs. p. 77–78, eqs. Summary p. 75. Price: F 4.—. **DWB**—The theory of energy and mass transfer at the earth's surface (up to 25 m) is treated in detail in this monograph and a classification based on the heat balance (after GEIGER) elaborated and discussed. The various aspects of the microclimatic layer are then treated with respect to the processes or parameters most influential in these layers: velocity and density profiles, frictional and convective turbulence, stability, free and forced convection and transition from turbulent to laminar flow, and empirical verification of these equations. Finally, the application of the theory to transformation of air masses over land and sea and near coastlines is developed in detail. *Subject Headings:* **1. Micrometeorology 2. Heat balance classification 3. Air mass transformation 4. Energy exchange sea-atmosphere.**—*M.R.*

6.6–15 551.591(02)

Berezkin, Vl. A., **Dal'nost' vidimosti kak ob'ekt meteorologicheskikh nabliudenii.** [Range of visibility as an object of meteorological observations.] Leningrad, Gidrometizdat., **1949.** 98 p. 15 figs., 7 tables, refs., eqs. **DLC**—A comprehensive pamphlet covering many theoretical and practical aspects of visibility and its measurement. It is intended as a manual for observers as well as a text for those interested in the physics of visibility. Numerous tables and a number of nomograms are included to assist in calculating day, twilight and night visibility under different conditions of turbidity and solar angle, etc. International scales and standards are included along with Russian standards and research results in the field of visual range, extinction, contrast threshold, instrumentation, visibility of distant lights, stars and nonluminous objects at night and optical visibility. *Subject Headings:* **1. Visibility 2. Textbooks 3. Observers manuals.**—*M.R.*

6.6–16 551.591:621.397

†U. S. Weather Bureau, **Final approach visibility studies. Fiscal year 1952, Progress Report, Pt. 3.** Prepared for the U. S. Air Navigation Development Board, Project 4.14. Jan. **1954.** 92 p. 20 figs., 90 refs. **DWB**—The experiments made at Washington National Airport in March and April 1952 to see if television could be used to improve visibility observation toward the end of runways during instrument conditions indicated that in daytime the TV is comparable to eye observations, but at night the eye is far more sensitive and reliable than the TV even when the eye is dark-adapted to the screen. No observations were made

during fog, smoke, heavy rain, snow, drizzle or dust, so conclusions are not definitive. The Dumont TV camera was installed at the south end of the instrument landing runway and signals transmitted 2900 ft to the WBAS Observatory. Observations were made on 7 occasions for 6 hours each. Project history, equipment used and results are given in great detail and an extensive bibliography is included. *Subject Headings:* **1. Visibility observation techniques 2. Television visibility observation 3. Washington National Airport. I. Haynes, Benarthur C. II. Harrison, L. P.**—*M.R.*

GENERAL GEOPHYSICS AND METEOROLOGY

INTERNATIONAL GEOPHYSICAL YEAR AND EXPEDITIONS

See also: **Scientific problems on Mount Everest** (Pugh), 6.6–312; **Expedition to Cho Oyu** (Skipton), 6.6–320; **Australian Antarctic expedition . . .** (Law), 6.6–358.

6.6–17 550.3:91.04 551.5:91.04

Chapman, Sydney, **Scientific programme of the International Geophysical Year 1957–58.** *Nature*, London, 175(4453):402–406, March 5, **1955.** fig. **DWB**—Summary of programs in meteorology, geomagnetism, aurora, airglow and zodiacal light, cosmic rays, solar observations (1957–58 is near a sunspot maximum) including solar radio sources, ionospheric investigations, latitudes and longitudes, glaciology, oceanography and upper air investigation by rockets. Map shows proposed auroral, ionospheric and magnetic stations in geomagnetic Northern Hemisphere. *Subject Heading:* **1. International Geophysical Year, 1957–58.**—*C.E.B.P.*

6.6–18 550.3:91.04 551.5:91:04

International Geophysical Year Program. *Science*, 119(3093):457, April 9, **1954. DWB**—In the International Geophysical Year Program during 1957–58, 28 nations will cooperate. U. S. program has been drawn up by the National Academy of Sciences—National Research Council. It embraces the entire earth: Arctic-Antarctic, sea, land, mountains, etc. and covers 10 fields of geophysics instead of only 3 or 4 as in past two Polar Year programs. Members of U. S. National Committee under JOSEPH KAPLAN are listed. Also coordinating committee chairmen for various aspects are listed (H. WEXLER for meteorology, ELVEY for aurora and airglow, DORFF for cosmic rays, etc.). *Subject Headings:* **1. International Geophysical Year, 1957–58 2. International Geophysical Year program 3. U. S. National Committee for the International Geophysical Year.**—*M.R.*

6.6–19 551.506.5(988)

Kuhn, Arthur, **Die Dänische Pearyland-Expedition 1947/1950.** [Danish Peary Land Expedition.] *Polarforschung*, Kiel, [Ser.] 3, 23(1/2):249–250, **1953.** 3 refs. **DWB**—Notes on observations at Börnlunds-Fiord in far north, including effects of frost, solifluction and wind, and monthly mean temperatures 1948/49 and 1949/50. Minimum at base −44°C but lower inland. On Chr. Erichsen glacier ablation (162 mm/yr) exceeded accumulation (114 mm); glaciers are retreating. *Subject Headings:* **1. Arctic expeditions 2. Peary Land, Greenland.**—*C.E.P.B.*

6.6–20 91.04(98) 551.5:06(73)

U. S. Weather Bureau, **United States Weather Bureau.** (In: **Encyclopedia Arctica, Vol. 7, Meteorology and Oceanography,** [Unpub. ms., photostat, July **1951.** Pt. 4.] 18 p. 18 refs. in text.) **DWB**—The history of Arctic expeditions and stations (as in Alaska) sponsored by the national weather service from its establishment as the Signal Service in 1870 to 1948 is outlined. Individual expeditions are described and reference is made to full accounts available. *Subject Headings:* **1. U. S. Weather Bureau 2. Arctic expeditions 3. Alaska.**—*G.T.*

NETWORKS AND OBSERVATORIES

6.6–21 551.501:551.578.4

De Quervain, Marcel R., **Bericht über die Tätigkeit des Eidg. Institutes für Schnee- und Lawinenforschung 1952/53 (gekürzt).** [Abridged report on the activity of the Swiss Institute

for Snow and Avalanche Research, 1952/53.] *Schweizerische Zeitschrift für Forstwesen*, Bern, No. 7, **1954.** 5 p. Abstracted from reprint. **MH-BH**—Brief summary of scientific activities (meteorological and hydrologic measurements, crystallography, snow mechanics, snow and avalanche protection, research on hail) and public services. Includes a list of some 20 reports and publications issued by the Institute or members during the period March 1953–Jan. 1954. *Subject Headings:* **1. Snow research. I. Davos, Switzerland. Eidgenossisches Institut für Schnee- und Lawinenforschung.**—*G.T.*

6.6–22 551.501.9:551.509(899)

Avegno, Carlos Alberto, **A proposito de nuestra red de observadores.** [Our observers' network.] *Revista Orientación Meteorológica*, Montevideo, No. 7:27–30, June **1954. MH-BH**—Development and aims of the network of voluntary observers organized by the Meteorological Society of the Institute of Advanced Studies of Uruguay. *Subject Headings:* **1. Meteorological networks 2. Uruguay.**—*G.T.*

6.6–23 551.506:551.43(411)

Dybeck, M. W. and Green, F. H. W., **The Cairngorms weather survey, 1953.** *Weather*, 10(2):41–48, Feb. **1955.** fig., photo., 3 tables. **DWB**—Observations were made 10 times a day at 5 stations (heights 1680–4000 ft) in the Cairngorms, Scotland, during summer 1953. Temperatures, rainfall, wind regime, and humidity are described and discussed. Comparisons showed that the makeshift screens adapted from biscuit tins were satisfactory. *Subject Headings:* **1. Mountain observations 2. Scotland.**—*C.E.P.B.*

6.6–24 551.501.9:523.7

Thom, A., **The solar observatories of Megalithic man.** *British Astronomical Association, London, Journal*, 64(8):396–404, Oct. **1954.** 3 figs., 6 tables, refs. **DWB**—Over 200 megalithic sites in W. Scotland were examined for alignments or lines indicating rising or setting of sun at solstices or equinoxes. Calculated declination about 23°54′ gives an approximate date of 1800 B.C. From refraction rough temperatures were calculated: midwinter morning 25°F, evening 47°F; midsummer morning 44°F, evening 66°F. *Subject Headings:* **1. Megalithic observatories 2. Historical climates.**—*C.E.P.B.*

6.6–25 551.5:06(689)

The Meteorological Service of the Federation of Rhodesia and Nyasaland. *World Meteorological Organization, WMO Bulletin*, 3(2):72, April **1954. MH-BH**—A new service is being set up under the directorship of N. P. SELLICK, to cover Nyasaland, and Southern and Northern Rhodesia, with a staff of 80–90 professional and technical assistants and 150 observers to operate a network of 44 synoptic reporting stations and provide service to 14 airports. The history of the separate services of these territories since 1892 is recounted briefly. *Subject Headings:* **1. Meteorological services 2. Rhodesia 3. Nyasaland.**—*M.R.*

6.6–26 551.5:061.1(41)

Sutton, O. G., **Changes in the structure of the Meteorological Office.** *Meteorological Magazine*, London, 83(983):129–130, May **1954. DWB**—The Office is divided into two parallel but intercommunicating sides, one operational, including forecasting and supply of information, the other for research. An Assistant-Director for Public Services has been appointed. *Subject Heading:* **1. Great Britain. Meteorological Office.**—*C.E.P.B.*

CONGRESSES, CONVENTIONS AND ORGANIZATIONS

6.6–27 551.5:06

International Meteorological Organization, **Convention of the World Meteorological Organization. Message from the President of the United States, transmitting a certified copy of the convention of the World Meteorological Organization, which was opened for signature at Washington, Oct. 11, 1947 [with signatures], and a certified copy of a protocol relating thereto, which was signed at the same time.** *U. S. 81st Congress, 1st Sess., 1949,*

Senate. Executive C. [1949.] 22 p. **DWB, DLC**—Letter of PRESIDENT TRUMAN and longer explanation of ROBERT A. LOVETT, acting Secretary of State explaining the need for the U. S. ratifying the treaty and for the I.M.O. becoming an official U.N. Agency. The history of the I.M.O. is briefly outlined and the convention and resulting organization briefly summarized in this report which is followed by the English version of the original Convention at that time (Jan. 3, 1949), ratified or accepted to by 11 countries and signed by representatives of 41 countries. *Subject Headings:* **1. World Meteorological Organization 2. WMO. Convention 3. Treaties. I. World Meteorological Organization II. Lovett, Robert A.**—*M.R.*

6.6–28 551.5:06

Pacific Science Association, **Organizations engaged in scientific research on an international scale in the Pacific.** Compiled by the Pacific Science Council Secretariat, Bishop Museum, Honolulu, Hawaii. Aug. **1953.** 32 p. **DWB**—The location, organization, scope, publications and projects of the following organizations where activities are concerned primarily with the Pacific are presented. These are: the United Nations specialized agencies including the I.M.O., the South Pacific Commission, Inter-American Institute of Agricultural Sciences, International Fort Commission, Inter-American Tropical Tuna Commission, International Commission for the Scientific Investigation of Tuna, etc.; the Pacific Science Association, Pacific Science Board (Natural Research Council) and the Institute of Pacific Relations. *Subject Headings:* **1. Scientific organizations 2. International organizations 3. Pacific Ocean.**—*I.L.D.*

6.6–29 551.5:6

A[shford], O. M., **Applied meteorology.** *World Meteorological Organization, WMO Bulletin*, 3(3):98–100, July **1954. MH-BH**—A brief sketch of the development of applied meteorology is presented and the applications of meteorology in aeronautics and in industry and applied climatology are discussed. *Subject Headings:* **1. Applied meteorology 2. Aeronautical meteorology 3. Industrial meteorology 4. Applied climatology.**—*I.L.D.*

6.6–30 551.5:63:06

Rubiato, José M., **First Session of the Commission for Agricultural Meteorology.** *World Meteorological Organization, WMO Bulletin*, 3(2):42–46, April **1954. MH-BH**—The first session of the IMO Commission for Agricultural Meteorology met in Paris just 40 years ago under the presidency of M. ANGOT. The present meeting (Nov. 3–20, 1953) in Paris was presided over by JUAN J. BURGOS of Argentina. Problems discussed in this article are meteorological observations, climatological aids and forecasts for agriculture, biological aspects, collaboration with other agencies and helping to increase food production. The places in Paris and vicinity visited by the 60 delegates from 20 countries, are listed. *Subject Headings:* **1. Agricultural meteorology 2. WMO. Commission for Agricultural Meteorology 3. WMO. meetings.**—*M.R.*

6.6–31 551.5:06

†*World Meteorological Organization. Regional Association III (South America), **Abridged final report of the First Session, Rio de Janeiro, Sept. 15–25, 1953.** Its *Publication*, No. 22, RP. 10, **1954.** 77 p. Price: Sw. fr. 3.—. **DWB**—Complete report of conference at Rio, including list of representatives of member- and non-member states, other organizations and observers attending, the agenda, summary of work, list of 35 resolutions and 6 recommendations drawn up by the conference and, finally, a list of 79 documents distributed before and during the session. Subjects included networks (synoptic and radiosonde), agrometeorological studies, ships, reconnaissance flights, codes, Climat messages, ecology, mountain, arid zone and humid tropics studies, analysis centers, bibliography for S. America, hydrological studies, International Geophysical Year 1957–58, sferics network, etc. Report contains list of synoptic and aerological stations in each country and time of observation at each. On p. 60 mention is made of the *MAB* bibliography on Climate of South America. *Subject Headings:* **1. WMO Regional Association III (South America) 2. Synoptic networks 3. Station catalogs 4. South America.**—*M.R.*

6.6–32 551.5:061.2

Flohn, H., **Tagung der Deutschen Meteorologischen Gesellschaft in Berlin.** [Meeting of the German Meteorological Society in Berlin.] *Erdkunde*, 8(1):76–77, Feb. **1954. DLC**—Report of meeting of Sept. 28–Oct. 4, 1953, with very brief summaries of a number of papers. *Subject Headings:* **1. German Meteorological Society 2. Meteorological conferences.**—*C.E.P.B.*

6.6–33 551.5:061.3(43)

Mildner, P., **Tagung der Deutschen Meteorologischen Gesellschaft 1954 in Hamburg.** [Meeting of the German Meteorological Society in Hamburg, 1954.] *Umschau*, 54(21):663, Nov. 1, **1954. DLC**—Meeting Oct. 8–11, 1954, was mainly concerned with maritime meteorology, including cyclonic swell and visibility by radar. Other papers dealt with cloud development, weather rules and weather types, numerical forecasting, radiation balance, instruments, agricultural and bioclimatology and the use of punched cards in climatology. *Subject Headings:* **1. Meteorological conferences 2. German Meteorological Society.**—*C.E.P.B.*

6.6–34 551.5:061.3

D—, F. E., **Dublin meteorological and geophysical seminar.** *Weather*, 9(3):88–89, March **1954. MH-BH**—Summaries of papers. Georgii, J., **Greenland ice-cap meteorology,** Oct. 22–23, 1953; McLaughlin, P. J., **Atmospheric pollution,** Nov. 12; Bourke, P. M. A., **Potato blight,** Dec. 3; Nolan, P. J., **Coagulation of nuclei,** Jan. 21, 1954; and Petherbridge, P., **Natural lightning of buildings,** Feb. 4. *Subject Headings:* **1. Meteorological seminars 2. Dublin, Eire.**—*C.E.P.B.*

6.6–35 551.5:06(64)

Meteorological Service of Spanish Morocco. *World Meteorological Organization, WMO Bulletin*, 3(3):109, July **1954. MH-BH**—The history of the meteorological service of Spanish Morocco and its present organization and activities are described. *Subject Headings:* **1. Spanish Morocco Meteorological Service 2. Spanish Morocco.**—*I.L.D.*

PRACTICAL AND APPLIED METEOROLOGY

EDUCATION AND HISTORY

6.6–36 551.5(04)

Bergeiro Hargain, José Maria, **Posible capacitación ruralista, para interpretar el clima y el tiempo.** [Capacity of the rural population to interpret weather and climate.] *Revista Orientación Meteorológica*, Montevideo, No. 7:5–10, June **1954. MH-BH**—Popularization of meteorological knowledge is a primary concern of the Meteorological Society, Institute of Advanced Studies, Uruguay. In the past this objective was achieved mainly among the city population. Difficulties involved in the task of extending means of information to rural areas are discussed. *Subject Heading:* **1. Popular meteorology.**—*G.T.*

6.6–37 551.5:37

Dingle, A. N. (*Ohio State Univ., Dept. of Physics*), **Meteorology in the state universities.** *American Meteorological Society, Bulletin*, 34(8):355–356, Oct. **1953. MH-BH**—It is pointed out by the author that with increasing demands for service courses in weather for professional training in meteorology and for meteorological counsel in business and industry, the meteorology course increases in scope and diversity, so that state universities with their breadth of interest and diversity of student interest are capable of providing a firm base for meteorological training. *Subject Heading:* **1. Meteorological education.**—*I.L.D.*

6.6–38 551.5:061.1(058)

Eady, E. T., **Meteorology in transition. An essay review [of] the Annual report of the Director of the Meteorological Office 1953/54. London, H.M.S.O., 1954. M.O. 586.** *Weather*, 10(2):61–62, Feb. **1955. DWB**—Discussion of the slow progress in improvement of weather forecasting and possibilities of increasing it by basic research. *Subject Headings:* **1. Annual service reports 2. Great Britain. Meteorological Office.**—*C.E.P.B.*

MARINE, AVIATION, RADAR AND MEDICAL METEOROLOGY

6.6–39 551.501(26) 551.515.2

Rodewald, M. and Schröder, Werner, **Aus dem Brief eines "Ehemaligen" an seinen Lehrer.** [From the letter of an old student to his instructor.] *Wetterlotse*, No. 82:1–8, Jan. **1955.** fig. **DLC**—Extracts from a letter by SCHRODER with comments by RODEWALD, concerning some aspects of observing on board ship, navigation, and a report on weather in the hurricane "Hazel" at Baltimore (chart for Oct. 16, 1954). The chief point of interest was an abrupt fall of temperature from 20 to 15°C and a drop of wind from force 12 to 5–6, at passage of a cold front within the hurricane. *Subject Headings:* **1. Marine observation 2. Hurricane "Hazel" (1954).**—*C.E.P.B.*

6.6–40 551.5(26):92

Radley, J. R., **Obituary. Captain Sir Benjamin Chave, K.B.E.** *Marine Observer*, 25(167): 46–47, Jan. **1955. MH-BH**—Died July 4, 1954, aged 83. At sea from 1885 to 1932, he was a keen meteorological observer. From 1932 to 1949, Merchant Navy Agent at Southampton for the Meteorological Office. *Subject Headings:* **1. Obituaries 2. Chave, Sir Benjamin.**—*C.E.P.B.*

6.6–41 551.501.7:656.7(02)

U. S. Air Weather Service, **Flight folders.** Its *Manual* 55-5, March 1, **1954.** 13 p. **DWB**—Obligatory instructions for preparing flight folders for pilots or navigators requesting this service of Air Weather Service meteorologists. The new instructions incorporate the new POMAR and AIREP codes. The folder contains practical cross section tables of data, terminal and alternate forecasts and may contain weather map insertion as well as the POMAR flight log. Weather maps for route comprise surface, constant pressure level nearest flight height, prognostic surface and prognostic constant pressure level nearest flight level, charts for fixed or composite time. *Subject Headings:* **1. Flight planning 2. Forecasters manuals.**—*M.R.*

6.6–42 551.501.81

Weather radar in research and operations. *Meteorological Magazine*, London, 84(992): 51–54, Feb. **1955.** 10 refs. **DWB**—The discussion was opened by W. G. HARPER with a short survey of meteorological radar theory and practice and a description of recent development and research. He described the uses of radar in forecasting fronts and showers and investigating precipitation processes. A good discussion followed. *Subject Headings:* **1. Radar precipitation echoes 2. Radar storm detection. I. Harper, W. G.**—*C.E.P.B.*

6.6–43 551.5:662.2:539.1

Sutton, Sir Oliver Graham, **Thermonuclear explosions and the weather.** *Nature*, London, 175(4451):319–321, Feb. 19, **1955.** 6 refs. **DWB**—The summer of 1954 in Britain following atomic explosions in the Pacific was cool, wet and dull, but no records were broken. Long period records suggest that it was a continuation of a general trend, and aerological evidence does not show any relation to the explosions. The energy of the most violent explosion is only equal to that of one small depression. Debris thrown into the upper atmosphere was many times less than in the Krakatoa eruption, which had no effect on British weather. Radioactive nuclei are very unlikely to cause any significant increase of rainfall over a large area. *Subject Headings:* **1. Atomic explosion effects 2. Abnormal seasons.**—*C.E.P.B.*

METEOROLOGICAL OBSERVATIONS AND INSTRUMENTS

METHODS OF OBSERVATION

See also: **Phenological method** (Ledesma), 6.6–68.

6.6–44 551.501:551.578.4

Forbes, Bob, **Snow census.** *Flying*, New York, 54(2):28–29; 61, Feb. **1954.** photos. **DLC, DWB**—Activities of federal, state and private snow surveyors, now all organized within

the Western Snow Conference, are outlined with particular emphasis on the contribution of aircraft (aerial surveys, landings on mountain peaks). *Subject Headings:* **1. Snow surveys 2. Western Snow Conference.**—*G.T.*

6.6–45 551.501:551.508.77

Glasspoole, J., **Loan of raingauges.** *Meteorological Magazine*, London, 83(986):249–250, Aug. **1954.** Also in: *Weather*, 8(12):375–376, Dec. **1953. DWB**—Account of Royal Meteorological Society's scheme for purchase of raingages for loan to suitable observers. *Subject Heading:* **1. Rainfall observation.**—*C.E.P.B.*

6.6–46 551.501:551.551

Ishida, Tamotsu; Kusunoki, Kou; Kobayashi, Teisaku and Imai, Hideo, **Measurement of atmospheric turbulence around a forest.** (In: Sapporo, Japan. Hokkaido University. Institute of Low Temperature Science, **Studies on fogs in relation to fog-preventing forest. 1953.** p. 145–168. 25 figs., 5 tables, 9 refs.) **MH-BH**—Over a period of three years atmospheric turbulence was investigated by measuring horizontal and vertical components of wind velocity at various heights near a fog-preventing forest by means of hot wire anemometers. Frequency spectra of turbulent flow in the high frequency range were obtained by means of a heterodyne high frequency analyzer, a description of which is given. The turbulence components obtained by the automatic frequency analyzer were limited to the frequency range above 0.3 c.p.s.; energy spectra in the range of the lower frequencies were obtained by harmonic analysis for 72 terms applied to observations lasting 108 or 360 seconds. The intensity of vertical turbulence component above the forest is several times as large as that in front of the forest. This indicates the existence of strong up and down turbulence above the forest upon which the fog capturing capacity of the forest depends. Around the forest the austausch coefficient of turbulent flow in the range of frequencies 0.01 to 0.4 c.p.s. was 10^3 to 10^6 cm^2/sec at a height of over 10 m. *Subject Headings:* **1. Turbulence measurement 2. Forest influences.** —*I.L.D.*

6.6–47 551.501.1:551.578.46:551.579

*California. Dept. of Public Works. Div. of Water Resources, **Water conditions in California, March 1, 1954.** Reports of Div. of Water Resources prepared pursuant to Section 228, Article 2, Ch. 2, Div. 1 of Water Code. **1954.** 18+15 p. 49 tables, plates. Later issues available through April 1, 1955. **DWB, DLC**—Contains snowpack data, runoff forecasts, etc. Charts, graphs, tables, etc. accompany analysis. Extensive snow survey data as of March 1, 1954 for different basins and accumulated precipitations for period July 1, 1953 to Feb. 28, 1954 as total and % of normal are appended. Aerial survey snow depth measurements made in the Central Valley area for places from 7200 to 11,700 ft elevation and water content data for each reservoir March 1, 1954 are also included. (For issues Feb. 1940–March 1953, *see item* 5.6–237, June 1954, *MAB*.) *Subject Headings:* **1. Snow survey data 2. Runoff forecasts 3. Aerial snow surveys 4. California.**—*M.R.*

6.6–48 551.501.7(078)

U. S. Air Weather Service, **Airborne weather equipment operator.** Its *Training Guide* 50-4, May **1953.** 12 p. **DWB**—The manual outlines the procedures and materials to be used in training observers for reconnaissance flight observation and evaluation. The use of the dropsonde, radiosonde, adiabatic charts, coding and evaluating of reports obtained while on flights, as well as preparation for the flights, constitutes the main part of the course. References are given to the specific one of numerous manuals to be used in each step of the course. *Subject Headings:* **1. Observer training courses 2. Dropsonde observers 3. Training manuals.** —*M.R.*

6.6–49 551.501.3

Gold, E., **Beaufort wind scale.** *Weather*, 9(4):128, April **1954. MH-BH**—Objects to table of equivalent velocities for Beaufort forces given by Privett, D. W., **Some new wind charts for the South Atlantic Ocean** (*see item* 5.6–169, June 1954, *MAB*). Values based on Simpson's formula, internationally adopted at Paris 1946, should always be used. *Subject Heading:* **1. Beaufort scale.**—*C.E.P.B.*

6.6–50 551.501.4:629.13

Cook Research Laboratories, Skokie, Illinois, **Analytical techniques for the study of airborne observational systems.** Contract AF 33(038)-23324, Atmospheric Reconnaissance System Studies, Cook Project E.O. 409-37-10-14, Interim Progress Report, PR 17-10, Nov. 8, **1953.** 19 p.+numerous charts. **DWB**—An attempt at setting up a system to evaluate data handling systems for aircraft observations of all types. The evaluation can be made descriptively, mathematically or graphically. In this report the graphical or visual method of evaluation is emphasized. The elements like cost, weight, etc. of components, the efficiency, accuracy and reliability of the equipment or data are all incorporated in a scheme which is systematic, even if complicated. Various types of aircraft, in-flight processes, sensing instruments, mensural records, interpretive computations, and observational records are listed and assigned symbols which identify them and determine their position on the ordinate or abscissa of the charts. Four flow diagrams are then constructed and evaluated. *Subject Headings:* **1. Air-borne observational systems 2. Data processing.**—*M.R.*

6.6–51 551.501.42:551.508.41

Frith, R., **New barometer conventions with a note on the determination of gravity at the station.** *Meteorological Magazine*, London, 84(992):38–40, Feb. **1955. DWB**—The history of barometer scales in Britain is summarized. Standard definitions adopted by the W.M.O. in 1954 are set out. The revised formula for gravity is

$$g_{\phi h} = 980.616(1 - 0.0026373\cos 2\phi + 0.0000059\cos^2 2\phi) - 0.00009406\,h \text{ (ft)}$$

The resulting changes in barometer corrections are indicated. *Subject Heading:* **1. Barometer corrections.**—*C.E.P.B.*

6.6–52 551.501.42:551.571

Germany. Deutscher Wetterdienst, **Aspirations-Psychrometer-Tafeln.** [Aspiration psychrometer tables.] 3 ed. Braunschweig, Friedr. Vieweg, **1955.** 183 p. mainly tables. **DWB**—These famous tables have been considerably extended since the 1937 edition to include new requirements of international practice. The introduction is in German, English, French and Spanish. Tables are: saturation vapor pressure over ice and water (−35 to +100°C), vapor pressure and humidity tables (by 0.1°C steps of dry and wet bulb) and corresponding dew points, all valid for 755 mmHg with corrections for pressure; mixing ratio, specific humidity and difference between absolute humidity (g/m^3) and vapor pressure (mm); tables for calculating vapor pressure from readings of hair hygrometer and air temperature; dew point from v.p.; and saturation deficit. *Subject Heading:* **1. Psychrometric tables.**—*C.E.P.B.*

6.6–53 551.501.45:519.21

Goldie, N., **Probability paper and its applications in upper air climatology.** *Meteorological Magazine*, London, 83(990):359–368, Dec. **1954.** 7 figs., 3 tables, 8 refs., eqs. **DWB**—An account of construction and use of probability paper, including graphical estimation of mean and standard deviation and separation of two normal distributions. Examples include temperatures at 300 and 200 mb, wind components, and tropopause pressures. Advantages of probability paper are summarized. *Subject Headings:* **1. Statistical techniques 2. Probability paper.**—*C.E.P.B.*

6.6–54 551.501.45:551.507.321.2

U. S. Weather Bureau, **Tables for computing horizontal distance of pilot balloons (100 Gram).** Wash., D. C., Govt. Print. Office, June **1951.** 181 p. entirely tables. **DLC**—Extensive table for each level up to 25.5 km for 5.0° to 89.9° elevation angle (1 min. to 90 min. after release). *Subject Headings:* **1. Pilot balloon computation tables 2. Computation tables.** —*M.R.*

6.6–55 551.501.6:518.3 551.501.7:551.55

Emrich, Hans, **Nomogramme des Meteorologen: eine Sammlung graphischer Zahlentafeln für den täglichen Gebrauch.** [Nomograms for the meteorologist; a collection of

graphic numerical tables for daily use.] Wiesbaden, May 1941. 30 p. diagrs., tables, graphs, in text and in pocket (some fold.). **DWB**—An admirably concise and practical set of nomograms for calculation, reduction or conversion of pressure, temperature, humidity, wind or cloud height data. The theory of preparing nomograms is clearly outlined and demonstrated. Each different nomogram (contained in a pocket at back of monograph) is described, the formulas on which it is based are given and explained and applications cited. A special section is included on gradient wind scales, their construction and use. *Subject Headings:* **1. Nomograms 2. Gradient wind scales.**—*M.R.*

6.6–56 551.501.6:518.32

U. S. Air Weather Service, **Memorandum on construction of a device for measuring contour curvature.** Its *Technical Report*, 105–105, March 1953. 2 p. 2 figs. **DWB**—Construction of a curvature overlay (a device for measuring curvature at a specified point on synoptic pressure charts) is explained. Use of the device is described, illustrated and shown in an example. *Subject Headings:* **1. Templates 2. Computing aids.**—*G.T.*

6.6–57 551.501.7:551.508.57

Gustafson, A. F., **The error in rawin computations due to neglecting the earth's curvature.** *American Meteorological Society, Bulletin*, 35(7):295–300, Sept. 1954. 4 figs., 2 refs., 11 eqs. **MH-BH**—General expressions giving the error in rawin computations arising from the neglect of the earth's curvature are derived. The error is found to be a function of the height of the balloon, the elevation angle, the wind speed, and the balloon ascent rate. The results are presented in the form of a graph which can be used by researchers to correct wind observations made without taking the earth's curvature into account. The nature of the curvature errors is such that maximum values of both wind speeds and wind shears tend to be exaggerated. *Subject Heading:* **1. Rawin computation errors.**—*Author's abstract.*

6.6–58 551.501.7:551.557:551.596.1

Von dem Borne, Heinrich, **Windmessung auf akustische Grundlage.** [Acoustic wind measurement.] *Meteorologische Rundschau*, 7(11/12):217–220, Nov./Dec. 1954. 3 tables, 10 refs., 5 eqs. **MH-BH**—Methods are set out, with tables, for determining wind velocity from deformation in the free air of a sound wave, using 4 microphones placed in 4 main directions around the source, and timing arrival of the sound or measuring phase changes. The results are stated to be accurate if the air temperature is known. *Subject Heading:* **1. Acoustical wind sounding.**—*C.E.P.B.*

6.6–59 551.501.83:551.594.221

Isikawa, Haruzi and Takagi, Masumi, **On the fine structure of atmospherics from near origins.** *Nagoya. University. Research Institute of Atmospherics, Proceedings*, 2:9–25, Jan. 1954. 15 figs., 7 tables, 16 refs. **DWB**—Details in the wave forms of sferics originating in intra-cloud and cloud-to-ground discharges are investigated (pulse intervals, pulse amplitude, etc.). It is found that certain types of intra-cloud discharges may generate sferics having wave forms identical with those originating from the main strokes of cloud-to-earth discharges. *Subject Headings:* **1. Sferics wave forms 2. Sferics from thunderstorm 3. Lightning discharges.**—*G.T.*

6.6–60 551.501.83:551.515.8

Kimpara, Atsushi, **Atmospherics accompanied by cold fronts.** *Nagoya. University. Research Institute of Atmospherics, Proceedings*, 2:92–94, Jan. 1954. 5 figs., 5 refs. **DWB**—As an example of the connection between sferics and cold fronts, the author discusses and illustrates the passage of a cold front with thunderstorms over Japan on Sept. 3, 1953, and presents records of intensity variation and directional distribution of sferics recorded at Toyokawa Observatory. From this and other evidence the author deduces that clearly defined cold fronts are generally accompanied by sferics when they are activated by impinging on the Japanese Islands after passing over the Sea of Japan, or by ascending the central mountain ranges of Japan. In addition to these cold-front type sferics, the author mentions

those having distant origins and briefly discusses their connection with world-wide thunderstorm distribution in fall. *Subject Headings:* **1. Sferics from cold fronts 2. Sferics from distant sources 3. Global thunderstorm distribution 4. Japan.** —*G.T.*

6.6–61 551.501.83

Kimpara, Atsushi, **The waveform of atmospherics at night.** *Nagoya. University. Research Institute of Atmospherics, Proceedings*, 2:1–8, Jan. **1954.** 3 figs., 25 plates, 6 refs. **DWB**—With a view of investigating the change of waveforms of sferics with distance, the author discusses the waveforms observed simultaneously at Toyokawa, Kumamoto and Akita stations, Japan, in 1952. They are classified into 5 groups according to the distance: *A*) more than 4000 km, *B*) 3–4000 km, *C*) 2–3000 km, *D*) 1–2000 km and *E*) less than 1000 km. The investigation reveals that in *A* and *B* the waveforms depend mainly upon the characteristics of trajectories, in *D* and *E* upon activities in meteorological phenomena and in *C* upon both meteorological and propagation conditions. *Subject Headings:* **1. Sferics wave forms 2. Japan.**—*From author's abstract.*

6.6–62 551.501.83

Sao, Kazuo and Nakai, Taketoshi, **Some results of the wave form of atmospherics.** *Nagoya. University. Research Institute of Atmospherics, Proceedings*, 2:26–30, Jan. **1954.** 3 figs., 2 tables, eq. **DWB**—Sferics were observed in Sept. in 1952 and 1953. The wave forms were recorded and sources were located by triangulation at Toyokawa, Akita and Kumamoto. Wave forms of the regular peaked type at night were analyzed according to the reflection theory. The reflection height of the ionosphere and the distance of the source were calculated. Several wave forms from the same sources received at Toyokawa and Akita are discussed. Some examples are shown, indicating that the quasi-period of the second half cycle of the oscillatory component increases with distance. A general explanation is given. *Subject Headings:* **1. Sferics wave forms 2. Japan.**—*Authors' abstract.*

OBSERVATIONAL DATA

6.6–63 551.506:681.177

*Smith, Maynard E. and Singer, Irving A., **Applicability and key to meteorological punch card data, April 1950–March 1952.** U. S. Brookhaven National Laboratory, Upton, N. Y., Contract AF 19(604)-490, Technical Report, No. 48, March **1954.** 12 p. 12 figs. (incl. photos of instruments), 7 refs., eqs., forms. *U. S. Atomic Energy Commission, BNL*, No. 288, March **1954. DWB**—Data includes weather, sky, visibility, ground and wind conditions (hourly) at 37 to 410 ft heights above ground. In addition to a descriptive key to data in each column of the punch card (used for Brookhaven micrometeorological data), there is a description of installations, local topography, instruments and equipment to provide information for interpretation of records. Outdoor and indoor equipment are illustrated, as well as the punch cards. *Subject Headings:* **1. Punched card codes 2. Micrometeorological data 3. Brookhaven, N. Y.**—*M.R.*

6.6–64 551.506:598.2

Whillis, Joyce, **Bird-watcher's weather.** *Weather*, 9(3):80–82. March **1954. MH-BH**—Brief description of effects of disturbed or misty weather on movements of birds and use of weather and shipping forecasts by bird-watchers. *Subject Heading:* **1. Weather and birds.**—*C.E.P.B.*

6.6–65 551.506.1(058)(436)

*Austria. Zentralanstalt für Meteorologie und Geodynamik, **Jahrbuch, 1938/1945, N.F. 75/82, Ergänzungsband.** [Yearbook, 1938/1945, new series, vol. 75/82, Supplement.] Pub. **1953.** 96 p. mostly tables. Note: 1938/1945 Yearbook, pub. 1948, is vol. 83/90 of the old series. **DLC**—This supplement to the 1938/1945 vol. contains the summaries of the climatological observations recorded at 200 stations in Austria. For 1938 only the data from representative stations were included. In general this supplement adheres to the scheme B of the remaining yearbooks. About half of all elements recorded for stations with barometric

data. The fixed values of temperature, number of days with precipitation of at least 1 mm clear and cloudy days, ice and summer days, and frequency of wind direction and calms are included. A list of all weather stations in Austria is included. *Subject Headings:* **1. Observational data 2. Climatic summaries 3. Yearbooks 4. Austria.**—*I.L.D.*

6.6–66 551.506.7:551.507.362

Green, Charles F. (*General Electric Co., Aeronautics and Ordnance Systems Div.*), **V-2 rocket in upper atmosphere research.** *Aero Digest*, Wash., D. C., 67(5):20–26, Nov. **1953.** 10 figs. **DWB**—Between April 16, 1946 and Oct. 29, 1951, 66 captured V-2 rockets were launched from White Sands Proving Ground, N. Mex., and 3 elsewhere. More than 20 tons of instruments and scientific equipment were carried to altitudes up to 250 mi above sea level. New warheads were made by the Naval Gun Factory and supplied to various agencies interested in upper atmosphere research. Successful flights (50 to 132 mi height) were obtained in 44 cases or 67% of all launchings. A Bumper (a WAC Corporal launched from the nose of a V-2 near the top of its flight) reached 242.5 mi. Modifications for the benefit of G.R.D. and other agencies were made to 36% of those launched. Difficulties in assembly, launching, etc. are described and failures analyzed. *Subject Headings:* **1. Rocket soundings 2. V-2 rockets 3. Upper air research 4. White Sands Proving Ground, N. Mex.**—*M.R.*

6.6–67 551.506.7:551.510.53

*U. S. Office of Naval Operations, **A study of the atmosphere between 30,000 and 100,000 feet. Preliminary Report, (and) Second, Third, and Fourth Reports.** *U. S. Office of Naval Operations, NAVAER* 50-1R-224, 224A, 224B and 224C, Sept. **1948,** May **1949,** April **1950,** and Nov. **1950.** 4 pieces. mostly graphs, tables, figs. **DWB**—Elaborate statistics are presented, mainly in graphic form, of pressures, temperatures, wind speed, direction, changes in wind with place, height and time and drift of "skyhook" balloons and other results of rocket ascents at White Sands, New Mexico, Alaska and other places around the world with special emphasis on the upper troposphere and stratosphere. Averages, frequency distributions and individual soundings are presented in the thousands of diagrams, wind roses, histograms and individual sounding diagrams. *Subject Headings:* **1. Upper air studies 2. Stratospheric wind data 3. Stratospheric temperature data 4. White Sands Proving Ground, N. Mex.**—*M.R.*

6.6–68 551.506.8:551.501

†Ledesma, Néstor René, **Registro fitofenológico integral.** [Integrated phytophenological registry.] *Meteoros*, Buenos Aires, 3(1):81 96, Jan./March **1953.** fig., table, 15 refs. Spanish and English summaries p. 81. **DWB**—The system proposed consists of recording simultaneously the phenological state of all the visible plant organs at very short intervals. The phenomena are recorded by means of symbols such as dots, dashes, curved dashes, each corresponding to a particular organ; the number of signs indicates the intensity of phenological development on a scale of five; each symbol representing 20% of the maximum intensity. The symbols are placed along the sides of rectangle in a table in which the phenological stage is along the vertical and the individual organ along the horizontal. *Subject Headings:* **1. Phenological method 2. Argentina.**—*I.L.D.*

INSTRUMENT CARRIERS

See also: **Pilot balloon comput. tables** (U.S.W.B.), 6.6–54; **V-2 rocket** (Green), 6.6–66; **Upper air airplane research** (James), 6.6–157.

6.6–69 551.507.2

Veranneman, Norbert L., **Ocean weather stations in new North Atlantic agreement.** *World Meteorological Organization, WMO Bulletin*, 3(2):56–58, April **1954. MH-BH**—A nine station network was agreed upon, and the agreement is to last for 2 years beginning July 1, 1954, with provision for one-year extensions. Thus a network of 9 instead of 10 stations will result in use of 21 instead of 25 vessels and a correspondingly greater economy. At the 4th Conference of ICAO on North Atlantic Weather Stations held at Paris Feb. 9 to 25, 1954, 15 countries and 5 international organizations were represented. *Subject Headings:* **1. Ocean weather stations 2. North Atlantic.**—*M.R.*

6.6–70 551.507.362

Colorado. Univ. Upper Air Laboratory, **Biaxial pointing control development.** Contract W19-122-ac-9, Final Report, Nov. 30, **1953.** 26 p. 4 figs. **DWB**—This final report includes: 1) a list of administrators, personnel and facilities, 2) abstracts of the 21 progress reports and 7 special reports issued under the contract (April 1948–Nov. 1953), 3) a concluding analysis and research summary (p. 18–25) and 4) a list of publications contributed by contract personnel. The purpose of the contract was the construction of a "sun follower" to be mounted in the nose cone of rockets with a view of holding an instrument in alignment while the rocket is in flight. The device is described and illustrated, its operation explained and its circuit diagrams presented. *Subject Headings:* **1. Rocket instrumentation. I. Pietenpol, W. B.**—*G.T.*

6.6–71 551.507.362

Nidey, Russel A., **A photoelectric Aspect Eye system for rocket instrumentation.** Colorado. Univ. Upper Air Laboratory, Contract W19-122ac-9, Special Report, No. 5, March 31, **1953.** 23 p. 13 figs. **DWB**—The Aspect Eye is a unit capable of determining the position of the sun relative to the Unit. The Unit is an array of six or more photoelectric detectors and is intended for rocket installation. The signals from the detectors are interpreted by the use of nomograph to give the two angular coordinates of the sun relative to the rocket vehicle. Equipment shown in detailed photographs and line drawings. *Subject Headings:* **1. Rocket instrumentation 2. Photoelectric Aspect Eye.**—*Author's abstract.*

6.6–72 551.507.362:537.312

*Nidey, Russell A. and Cocharo, Grayson, **Photoelectric eyes for a solar pointing control.** Colorado. Univ. Upper Air Laboratory, Contract W19-122 ac-9, Special Report, No. 7, May 31, **1953.** 50 p. 30 figs., refs. p. 47. **DWB**—The error detection devices for a servo reflect the particular requirements of that servo. The rocket borne Solar Pointing Control has posed specific requirements in stability and angular characteristics. In order to insure stability the phototubes are carefully selected. An extensive testing procedure eliminates the tubes likely to fail in use. The desired angular characteristic is obtained by the use of an array of phototubes. By utilizing the 1P42 phototube, the smallest commercially available vacuum phototube, as many as twenty-one tubes have been flown in a single pointing control without unduly taxing the available space. In addition to the servo eyes, there is the target eye, which serves as a sight to determine whether or not the servo is performing properly; and the aspect eye which determines the vehicle behavior as related to servo performance. *Subject Headings:* **1. Photoelectric control 2. Rocket control.**—*Authors' abstract.*

6.6–73 551.507.362

Tufts College. Dept. of Electrical Engineering, **Blossom IV-F; Aerobee Round 12; Development of VHF transmitter, power supply, antenna, and insulating package for use with high altitude balloons.** Contract AF 19(122)-63, Progress Reports, 8 and 9, March 15 to Sept. 15, **1951.** 26 p. 45 figs. (many fold.). **DWB**—Report covers details of preparation and flight of two rockets: Aerobee Round 12 and Blossom IV–F, and improvements on data decoding facilities. Also the work done in developing a balloon-borne transmitter, power supply, antenna and thermal package which was produced for flight testing and all of the wiring, details, photographs of parts of equipment, test data, etc. are presented. *Subject Headings:* **1. Rocket instrumentation 2. Rocket soundings.**—*M.R.*

6.6–74 551.507.362

Utah. University, **Physical properties of the upper atmosphere.** Contract W19-122 ac-15, Progress Report, No. 17, May 31, **1952,** and Final Report for the Contract. Pub. July 30, **1952.** 50 p. 8 figs., table, refs. **DWB**—An administrative report outlining the activities of the project which was mainly concerned with the development of air-borne and ground equipment for the study of electromagnetic waves at various altitudes by means of V-2 rockets and aerobees. The method of attack was several times modified during the development of the work. Great care was taken in the construction of an antenna adequate from both the transmission and aerodynamical points of view. The desired data about ion density transmission constants, etc. were not obtained since all the rockets misfired with the exception of

one whose beacon failed shortly after landing. Circuit schemes for the developed equipment are included. *Subject Headings:* **1. Rocket research 2. V-2 rockets 3. Aerobee rockets 4. Upper air soundings.**—*A.A.*

INSTRUMENTS

See also: **Thermometer measurements** (Kramer, others), 6.6-10; **Precip. measurements** (Hiser, Huff), 6.6–11; **Loan of raingauges** (Glasspoole), 6.6–45; **Barometer conventions** (Frith), 6.6–51; **Rawin comput. errors** (Gustafson), 6.6–57; **Temp. of stratosphere** (Elterman), 6.6–159.

6.6–75 551.508.25:628.97

Longmore, J. and Hopkinson, R. G., **A simple daylight factor meter.** *Journal of Scientific Instruments*, 31(6):214–217, June **1954.** 4 figs., 3 refs. **DLC**—Daylight factor is ratio of daylight illumination on a horizontal plane in a building to that from an unobstructed sky (direct sunlight excluded). The instrument is a G.E.C. illumination meter M903 with a variable resistance and an adjustable louvred mask. The resistance is set to give a standard dial reading outdoors, and then placed on the surface to be measured and the mask removed. Final calibration is against a visual photometer. *Subject Headings:* **1. Daylight meters 2. Illumination.**—*C.E.P.B.*

6.6–76 551.508.91

Pearson, C. A. (*Naval Res. Lab., Wash., D. C.*), **Recording horizontal atmospheric transmission of light at night.** *American Meteorological Society, Bulletin*, 35(1):33–39, Jan. **1954.** 11 figs., 6 refs. **MH-BH**—A photoelectric telephotometer, which measured the illumination produced at a fixed distance from a light source of known candle power, was developed to record directly the total horizontal atmospheric transmission of light at night over a two sea-mile path. The apparatus consisted of a multiplier phototube, a DC amplifier, batteries for operation, and a one-milliampere recorder. It can be set up easily for field use. A 1000-watt projection-type lamp was used as a light source. By means of a standard lamp, the photoelectric telephotometer was calibrated in a laboratory light tunnel to record illumination in sea-mile candles. In the field the photoelectric telephotometer was compared with a visual telephotometer. Transmission measurements showed good agreement between the photoelectric and the visual methods. *Subject Headings:* **1. Atmospheric transmission 2. Photoelectric telephotometer.**—*Author's abstract.*

6.6–77 551.508.25:551.521.61

Randall, H. M. (*Physics Dept., Mich. Univ.*), **Infrared spectroscopy at the University of Michigan.** *Optical Society of America, Journal*, 44(2):97–103, Feb. **1954.** 5 figs. **DWB**—Historical review of work of author and colleagues, and the German theoretical physicists since 1909 when the first infrared atomic spectra were measured by PASCHEN at Tübingen, and a description of gratings and spectrometers developed at the Univ. of Michigan for measuring emission spectra of various elements in the infrared. *Subject Headings:* **1. Infrared spectroscopy 2. Michigan. University.**—*M.R.*

6.6–78 551.508.26

*Kaempfert, Wolfgang, **Thermometerqualitäten in Theorie und Praxis.** [Thermometer characteristics in theory and practice.] *Germany. Deutscher Meteorologischer Dienst im Französischen Besatzungsgebiet, Wissenschaftliche Arbeiten*, 1:67–74, **1947.** 3 figs., 9 tables, eqs. German and French summaries p. 73-74. **DLC**—The various errors which occur in reading thermometers and in the instruments themselves are analyzed quantitatively and the corrections to be applied discussed. On the whole, errors can be reduced to a negligible minimum by proper handling and observation methods, but can never be eliminated. Theory based on NEWTON's cooling law is applied to develop an empirical correction formula which varies with exposure time and other conditions. An accuracy of 0.1°C with a half lag of ca. 1 minute can give good readings when appreciable changes in temperature occur over a 5 or 10 min period. *Subject Headings:* **1. Thermometer corrections 2. Thermometers.**—*M.R.*

6.6–79 551.508.26

Kolosov, M. A., **Perenosnyĭ elektrotermometr.** [Portable electro-thermometer.] *igiena i Sanitariia*, Moscow, No. 10:49–51, Oct. **1953.** 3 figs. **DLC**—A description of the onstruction of a portable electric thermometer in the form of a pointer galvanometer. The esistance of the thermo-elements was reduced considerably by shortening the distances etween the zero-point junction and the active junction. The calibration is described and oth a circuit diagram and an illustration of the apparatus are given. *Subject Headings:* **Electric thermometers 2. Instrument calibration.**—*I.L.D.*

6.6–80 551.508.26:629.13

Murgatroyd, R. J., **A report on the determinations of the speed correction coefficients f aircraft thermometers made by M.R.F. in 1951.** *Great Britain. Meteorological Research ommittee, M.R.P.* 822, June 16, **1953.** 11 p. 6 tables, 5 refs., 7 eqs. Mimeo. **DWB**—In Pt. correction to indicate dry bulb temperature is $\alpha(V/100)^2$, V = true air speed, knots. Values α with 3 flat plate (with and without trip wires) and 2 conical head thermometers are given. o systematic increase of α was found between 5000 and 21,000 ft for flat plates but conical eads gave a slight increase. Trip wires decrease α(1.55 to 1.15). In Pt. II the technique of etermining α for aircraft thermometers is described. In a calibrated research aircraft an ccuracy of 0.5°F should be attained but in a fast uncalibrated aircraft error may be up to °F. Some comments by D. D. Clark are appended. *Subject Headings:* **1. Aircraft ther-ometers. I. Clark, D. D.**—*C.E.P.B.*

6.6–81 551.508.26

Rogers, Roy J., **Annual thermometer testing.** *California Citrograph*, 36(1):490, Oct. **951.** Also his: **Annual testing of fruit growers' thermometers.** *Ibid.*, 37(12):472, Oct. **1952.** lso article with anonymous author: **Thermometer testing time in October.** *Ibid.*, 38(12):458, ct. **1953. DA**—Between 22,000 and 25,000 thermometers are tested and serviced each year y the U.S.W.B. Fruit Frost Service. The annual testing begins on Oct. 7, 8 or 9 in Ventura, nd Santa Barbara counties and Oct. 12 or 13 in Los Angeles, Riverside, Orange and San ernardino counties. Instructions are given for packing and shipping thermometers to the sting stations. In the Central Valley and San Diego county, testing begins about Nov. 1. . S. Weather Bureau meteorologists assigned to fruit frost forecasting duty do the testing and acken the scales of all thermometers which are good. *Subject Headings:* **1. Thermometer sting 2. U. S. Weather Bureau. Fruit Frost Service 3. Southern California.**—*M.R.*

6.6–82 551.508.26

Sanuki, M. (*Met. Res. Inst., Japan*), **On the lag of thermometer exposed in the air of ariable temperature and variable wind velocity.** *Papers in Meteorology and Geophysics*, okyo, 3(2):172–174, Aug. **1952.** 2 figs., 3 refs. **MH-BH**—The equation of heat transfer etween the thermometer and the air in which it is exposed is solved graphically, assuming ie air temperature and wind velocity fluctuation to be sinusoidal and the thermometer lag efficient to be inversely proportional to the square root of wind velocity. Two examples e given, one of which is the case of constant air temperature and variable wind velocity, nd the other the case of variable air temperature and variable wind velocity. The influence wind velocity fluctuation upon the thermometer lag seems to be of negligible order even r large percentages of fluctuation. *Subject Headings:* **1. Thermometer lag 2. Temperature ariables 3. Wind velocity variables.**—*Author's abstract.*

6.6–83 551.508.26:551.525.4 551.584:551.525.4

Searle, S. A., **The measurement of plant climate.** Chichester Press, England, **1953.** 5 p. 6 figs., 13 plates, 18 refs. **GB-MO**—Discusses microclimate from lower limit of root one to top of vegetation. The factors are earth temperature, precipitation, cloud, sunshine, r temperature, etc., governing the heat transport to and from the ground. Monthly and nnual maps of 1 ft earth temperature under short grass in Britain are shown. A special plant climate thermometer" is described and illustrated and its use described, with examples. *ubject Headings:* **1. Soil thermometers 2. Soil microclimatology.**—*C.E.P.B.*

6.6–84 551.508.2

Wagner, Richárd, **Komplexhőmérséklet.** [Composite temperature.] *Időjárás*, 58(2) 72–77, March/April **1954.** fig. Russian and French summaries p. 72. **MH-BH**—Th author developed an electrical instrument measuring air temperature, radiational heat gai and heat loss by evaporation and wind. The value indicated by the instrument is termc composite temperature. Composite temperature values can be reduced to °C if desired. Th instrument was successfully used in bioclimatological and micrometeorological researc *Subject Headings:* **1. Temperature instruments 2. Thermoelectric measurement.**—*Tran of author's abstract.*

6.6–85 551.508.2

*Hader, Fritz, **Kann der Erdbodenabstand der Thermometerhütte verkleinert werder** [Can the distance between the ground and the thermometer screen be reduced?] *Wetter un Leben*, 6(1/2):27–31, March **1954.** 3 tables, 6 refs. **DWB**—In order to determine whether th construction of temperature shelters at a level of 1.5 m (as practiced in Austria prior to th adoption of 2 m height) would subject the measurements to microclimatic influences, ten perature and relative humidity observations were made at St. Pölten, Northern Austri from May 1952 to April 1953, at elevations of 1 and 2 m. The data giving the monthly mea for fixed daily readings and mean daily temperatures are presented in a table. In case temperature, both the monthly means of fixed readings and the daily means are nearly identic at both levels if decimals are neglected and only whole degrees are used; in case of the annu mean, the 2 m height is greater by 0.1°C. In regard to relative humidity, the difference between the two readings can be neglected only during the non-growing season; during th growing season the readings are influenced by the plant cover. *Subject Headings:* **1. Ther mometer screen height location 2. Microclimatic influences 3. St. Pölten, Austria.**—*I.L.I*

6.6–86 551.508.2

Ishikawa, S., **On the temperature on south and north side of a shelter.** *Journal Meteorological Research*, Tokyo, 5(2):103–110, March **1953.** fig., 5 tables. In Japanese English summary p. 103. **MH-BH**—Observation of winter temperature is sometimes difficu because monsoon winds blow snow and rain against the north side of instrument shelters. comparative investigation of the north and south sides of a shelter revealed that: 1) the ten perature difference between the two sides is not appreciable, 2) the probability of the occurren of appreciable difference in humidity is of the order of 1/10 and 3) temperature differenc between the two sides depends on wind speed. *Subject Heading:* **1. Instrument shelters.**— *Author's abstract.*

6.6–87 551.508.29:518.

Anderson, Victor C. and Rudnick, Philip, **A thermistor bridge correlator.** *Review Scientific Instruments*, 24(5):360–361, May **1953.** fig., 2 eqs. **DWB**—A circuit is describe for the measurement of a correlation coefficient between two continuous signals. The metho depends on an accurate mean square element which is obtained through the i^2r heating of thermistor. Relatively simple circuit features give accuracy to about 1%, even though th resistance of the thermistor varies by about 25% between zero and full input. *Subject Heading* **1. Thermistor correlators.**—*Authors' abstract.*

6.6–88 551.508.29:536.5

Bendersky, David (*Midwest Res. Inst., Kansas City, Mo.*), **A special thermocouple fo measuring transient temperatures.** *Mechanical Engineering*, New York, 75(2):117–121 Feb. **1953.** 14 figs., refs. **DWB**—A thermocouple of rugged construction for measurin transient temperatures at heat transfer investigations with a sensitive surface having a junctio thickness of only 1 micron is described. Although the instrument originally was develope for the measurement of metal surface temperatures from 0 to over 2000°F at high stress, it construction could be considered also for other applications. *Subject Heading:* **1. Thermo couples.**—*A.A.*

6.6–89 551.508.29:536.53

Murphy, E. A. (*Minneapolis-Honeywell Regulator Co., Phil.*), **Theory and application of thermocouples.** *Heating and Ventilating*, N. Y., 51(2):104–108, Feb. **1954.** 11 figs. **DWB**—Thermocouples are the cheapest, most adaptable, reliable and easily installed or maintained type of temperature measuring device, especially for distance recording or measuring. Numerous types, and their installation, calibration and applications such as in the climatic hangar of the U.S.A.F. at Eglin Air Force Base, Florida, where temperatures of −65° to +160°F are used in testing equipment. Thermocouples are used not only for measuring temperatures and thermal gradients in walls, but for warning of fire in case temperatures at any place reach a level 20° above that desired. Insulation of thousands of feet of wire used to connect thermocouples with recorders is a major problem in the hangar. Another application is to an office building in Omaha where 144 thermocouples located in every office and zone and outdoors are connected to a single panel for controlling air conditioning or heating levels without much physical labor on the part of the engineer in charge. *Subject Headings:* **1. Thermocouples 2. Thermocouple applications 3. Climatic hangars 4. Eglin Air Force Base, Florida.**—*M.R.*

6.6–90 551.508.29:551.586.6:633.18

Satone, H. (*Electr. Exper. Sta., Osaka*), **Electrical measurement of the temperature in the paddy field and thermal diffusibilities of its soil.** *Journal of Agricultural Meteorology*, Tokyo, 6(3/4):147–150, Aug. **1951.** 8 figs., table, 3 refs., 4 eqs. In Japanese; English summary p. 150. **DWB**—An electrical system for temperature measurement was constructed in a paddy field. The arrangement is composed of many copper-constantan thermocouples and recording resistance thermometers. Continuous measurements of diurnal waves of temperature in the atmosphere, water and the soil at various depth were performed. A harmonic analysis of diurnal waves in the soil and a theoretical calculation of thermal diffusivity of the soil in layers is offered. *Subject Headings:* **1. Thermocouples 2. Temperature measurement 3. Rice paddies.**—*Author's abstract.*

6.6–91 551.508.29

Seay, P. A. and Gordon, W. E., **Temperature recording with thermistors.** Texas. University. Electrical Engineering Research Laboratory, Contract N6onr-26602, Report, No. 16, June 1, **1948.** 9 p. 4 figs., table. **DWB**—Report on the adaptation of as many as 12 commercially available temperature-sensitive ceramic resistors to a single linear scale on which temperature obtained from wet and dry sensitive elements at various heights and locations is automatically recorded by using an automatic switching arrangement. The apparatus is described and shown in schematic drawings. The relation between temperature, resistance, circuit voltage and output voltage is analyzed in a series of equations and a temperature resistance curve for thermistors drawn up. The instrument was developed for micrometeorological soundings and is claimed to record temperatures with a tolerance of about 0.1°C. *Subject Headings:* **1. Thermistors 2. Temperature measurement 3. Micrometeorological instruments 4. Thermometry.**—*G.T.*

6.6–92 551.508.29

Temperature indicator. *Review of Scientific Instruments*, 25(5):532, May **1954.** fig. **DWB**—A sensitive rapid response (thermistor type) temperature indicator, for climate-survey purposes, is housed in a wooden box with attached carrying handle. Accuracy is ±0.5°F in all ranges. Response time is 6 seconds for 95% of steady condition. Sensing elements (2 dry or dry and wet bulb) can be located 800 ft away, or with special calibration 8000 ft away. Portable batteries provide for 500 hours of continuous operation. Several models give ranges ranging from −70° to +60°F to +10° to +140°F. *Subject Headings:* **1. Thermistors 2. Telethermoscopes.**—*M.R.*

6.6–93 551.508.29

Woollum, Clarence A. (*Wash. Natl. Airport, Wash., D. C.*), **An easily constructed remote temperature-indicating device.** *Weatherwise*, 5(4):93–94, Aug. **1952.** 4 figs., 2 refs. **MH-BH**—An apparatus consisting of a microammeter, a radiosonde thermistor, two flashlight cells, a variable resistor and hookup wire, is offered to amateur weathermen as an inexpensive

device for obtaining indoor readings of outdoor temperature with a reasonable accurac The article includes description and illustration of parts, and instructions for assembly a calibration of the instrument. *Subject Heading:* **1. Temperature instruments.**—*G.T.*

6.6–94 551.508.43:526

Graf, Anton, **Vergleich von Präzisionsbarometern untereinander im Hinblick auf barc metrische Höhenmessungen.** [Comparison of precision barometers with regard to barometr altimetry.] *Beiträge zur Geophysik*, 64(3):214–222, **1955.** 5 figs., 6 tables. **DWB**—T determine value of precision barometers, author took 3 Askania microbarometers, a Pauli membrane altimeter and a Thommen altimeter over 11 datum points with a height range 250 m. The readings are tabulated. It is concluded that because of the uncertainty of th pressure conditions the frictionless microbarometer is not appreciably more accurate than th ordinary aneroid for height determinations. *Subject Headings:* **1. Aneroid barometer 2. Surveying.**—*C.E.P.B.*

6.6–95 551.508.4

Zanon, Francesco Saverio (*Geof. Obs., Venice*), **Il microbarografo Alfani ed i fronti aero logici.** [The Alfani microbarograph and aerological fronts.] *Geofisica Pura e Applicata* 27:190–200, **1954.** 9 refs. Italian and English summaries p. 190. **MH-BH**—From th Macelwane microbarographs of cold fronts recorded in Ottawa and Florissant, results hav been obtained that are in good agreement with those found by the author in Venice with a Alfani microbarograph during the passage of similar fronts. *Subject Headings:* **1. Micro barograph comparisons 2. Cold fronts 3. North America 4. Venice, Italy.**—*Author' abstract.*

6.6–96 551.508.71

Wylie, R. G., **A new absolute hygrometer of high accuracy.** *Nature*, London, 175(4446) 118–119, Jan. 15, **1955.** 2 refs. **DWB**—The hygrometer depends on the fact that for a water-soluble crystal in contact with moist air a critical equilibrium temperature exists at which electrical resistance remains constant. A practical hygrometer is described in which a suitable crystal (several substances are mentioned) is mounted on two electrodes in a small isothermal metal container through which the moist gas is passed continuously. The resistance of the crystal is either read off on a deflecting instrument or made the basis of automatic operation. The method is reliable, accurate and rapid and will be used as the standard for testing hygrometers in the National Standards Laboratory, Sydney, Australia. *Subject Heading:* **1. Absolute hygrometers.**—*C.E.P.B.*

6.6–97 551.508.79:582.29

Beschel, Roland, **Eine Flechte als Niederschlagsmesser.** [A lichen as a precipitation measurement device.] *Wetter und Leben*, Vienna, 6(3/4):56–60, June **1954.** fig., table, 6 refs. **MH-BH**—The growth of lichens, especially *Caloplaca elegans*, on gravestones as affected by rainfall and by temperature is analyzed. The dependence of lichen growth upon rainfall is shown graphically as well as tabularly. A distinct relationship is established between growth and moisture absorption and total rainfall. *Subject Headings:* **1. Lichens 2. Plants as precipitation indicators.**—*I.L.D.*

SYNOPTIC ANALYSIS AND FORECASTING

See also: **Extended forecasting** (Grapper), 6.6–12; **Met. networks** (Avengo), 6.6–21; **Hydromet. study, Great Salt Lake** (Peck), 6.6–282; **Prediction of water level rise, Chubut River** (Raffo), 6.6–283.

6.6–98 551.509.1

Great Britain. Hydrographic Office, **The Admiralty list of radio signals, Vol. 4, Meteorological observation stations.** London, **1954.** 263 p. printed on one side only. **DWB**—Complete list of some 12,000 world meteorological stations arranged by countries, with station no., lat., long., and altitude (ft). *Subject Heading:* **1. Radio meteorological networks.**—*C.E.P.B.*

6.6–99 551.509.1(265)

Weather reporting in the south-west Pacific. *Marine Observer*, 25(167):39, Jan. 1954. **MH-BH**—Number of ship reports received by New Zealand Meteorological Office increased from 4820 in 1946 to over 20,000 in 1952 and 1953. *Subject Headings:* **1. Marine meteorological networks 2. Southwest Pacific.**—*C.E.P.B.*

6.6–100 551.509.25:551.509.54

Teweles, Sidney, Jr. and Forst, Albert L. (*U. S. W. B., Wash., D. C.*), **Forecasting winter precipitation 36 to 48 hours in advance at Des Moines, Iowa. An experiment using the prognostic chart as a data source.** *Monthly Weather Review*, 81(11):357–367, Nov. 1953. 17 figs., 2 tables, 8 refs. **MH-BH**—To determine the accuracy with which a precipitation forecast can be made from the features of the prognostic charts currently disseminated, an objective forecast system using only those features has been developed for the Des Moines, Iowa, area. As a means of finding predictors, sets of composite sea level and 700-mb charts were made up for very dry situations and for situations in which heavy precipitation occurred. In the final system, the various predictors are combined in scatter diagrams to give a forecast comparable in accuracy with that of the district forecast, of the occurrence of precipitation at Des Moines during a 12-hour period beginning 12 hours after the valid time of the 30-hour sea level prognostic chart. *Subject Headings:* **1. Objective forecasting 2. Precipitation forecasting 3. Prognostic charts 4. Des Moines, Iowa.**—*Authors' abstract.*

6.6–101 551.509.3:551.515.1(265)

Nagayama, M., **On the forecasting of the rate of development of cyclones generated in the southern part of East China in winter.** *Journal of Meteorological Research*, Tokyo, 4(12): 941–944, March 1953. 5 figs., 5 refs. In Japanese; English summary p. 59. **MH-BH**—Rate of development R of cyclones in SE part of China Sea is correlated with Q_h, conduction of sensible heat ($r=0.670$) and Q_a, total energy exchanged between sea and atmosphere ($r=+.487$). By calculating Q_h or Q_a using data for Nase in Ryukyu Islands from day when NW wind begins to blow to the day preceding cyclone formation, R can be forecast. *Subject Headings:* **1. Cyclone forecasting 2. China Sea.**—*C.E.P.B.*

6.6–102 551.509.3:551.509.54

§Otta, Endréné, **Egy váratlan időjárás-változás elemzése.** [Analysis of an unexpected weather change.] *Időjárás*, 58(2):77–80, March/April 1954. 3 figs. Russian and French summaries p. 77. **MH-BH**—A synoptic chart (Europe) and a vertical cross section (Aldergrove-Budapest) for Aug. 26, 1953 and a precipitation chart for Aug. 27–28 (Hungary) are presented and the pressure and weather development of Aug. 26–28 is described. The failure to predict the heavy rainfall of Aug. 27 was due to neglect of a cold front occlusion and a deepening cyclone. A more careful study of aerological data could have prevented the error. *Subject Headings:* **1. Synoptic studies 2. Precipitation forecasting 3. Hungary.**—*G.T.*

6.6–103 551.509.31:551.513.2

Oliver, Vincent J. and Oliver, Mildred B., **A method for applying tilted-trough theory to synoptic forecasting in the mid-troposphere.** *American Meteorological Society, Bulletin*, 34(8):368–375, Oct. 1953. 2 figs. table, 14 refs. **MH-BH**—MACHTA's mathematical model demonstrating the manner in which meridional angular momentum transfer is related to the tilt of troughs, is modified to include actual atmospheric conditions, namely, the existence of boundary conditions, the existence of jet streams and the existence of meridional gradients of relative vorticity. All of the (historical) 500 mb daily maps for 1949–1950 were analyzed in order to determine the gross changes in the circulation pattern of the atmosphere involving the development or dissipation of cyclonic vortices that are associated with different trough tilts and curvatures. A series of daily maps representative of the analysis are discussed. It is shown that the tilt and curvature of troughs and ridges can be used as an aid for one to two-day forecasts. *Subject Headings:* **1. Short range forecasting 2. Tilted trough theory 3. Atmospheric circulation.**—*I.L.D.*

6.6–104 551.509.311

§Chicago. Univ. Dept. of Meteorology, **Report on an experiment with forecasting of cyclone development.** Contract AF 19(604)-390, Technical Report, No. 4, **1954.** 21 p. figs., charts, refs. Contents: Pt. 1, Petterssen, Sverre, **The experiment,** p. 2–16. Pt. 2 Dunn, Gordon E. and Means, L. L., **The verification,** p. 16–21. **DWB**—An experiment aiming at forecasting the formation and intensification of extratropical cyclones, was conducted by the Weather Forecasting Research Center in collaboration with the U. S. Weather Bureau District Center, Chicago, from 4 January to 20 March 1954. The working hypothesis to be tested was formulated as follows: cyclonic development at sea level occurs when and where an area of positive vorticity advection in the upper troposphere becomes superimposed upon a frontal zone at sea level. The experiment which was conducted in connection with the routine operation of the District Center, resulted in 97 verifiable forecasts. The verification indicated that the working hypothesis is useful. *Subject Headings:* **1. Extratropical cyclone forecasting 2. Cyclone formation 3. Forecast verification.**—*Author's abstract.*

6.6–105 551.509.312

Amble, O. (*Norwegian Polar Inst., Oslo*), **A smoothing technique for pressure maps.** *American Meteorological Society, Bulletin,* 34(7):293–297, Sept. **1953.** 3 figs., 12 eqs. **MH-BH**—The author describes a method for constructing isobaric maps showing the distribution of the readings of damped barometers and comparing it with the method of calculating mean values, described by Namias, in which "a number of points forming a grid on a map, overlapping means of 5 days are calculated and isobars are drawn to suit the mean pressure data." The smoothed values are calculated using separate pressure value with equal time intervals. The theoretical basis of this method and its application to a specific situation are presented. *Subject Heading:* **1. Isobaric charts.**—*I.L.D.*

6.6–106 551.509.312

Institute for Advanced Study, Princeton, N. J., **Report of the director, 1948/1953.** pub. **1954.** 41 p. **DWB**—Along with reports of other activities in the History and Mathematics Faculties, the work and personnel of the Electronic Computer Project organized in 1946 by John von Neumann is described in a vivid style, with particular attention to the Meteorology Project (numerical weather prediction) established under the Computer Project in 1946 by Jules Charney, first using the Eniac Computer at Aberdeen Proving Ground, and after Jan. 1952 the Institute's computer, ultimately leading to "correct calculation of the great Appalachian storm of Nov. 25, 1950" and similar success for Nov. 12, 1952 and Nov. 5, 1953 storms, proving "that numerical methods are more accurate than all existing standard methods." *Subject Headings:* **1. Institute for Advanced Study, Princeton, N. J. 2. Numerical forecasting 3. Electronic computers. I. Oppenheimer, Robert.**—*M.R.*

6.6–107 551.509.312:681.142

Predict future weather. *Science News Letter,* Wash., D. C., 65(15):239, April 10, **1954. DWB**—Brief note on remarks made by C.-G. Rossby at a seminar at U. S. Weather Bureau in Wash., D. C., March 25, 1954 to the effect that the first successful use of an electronic calculator in making a daily prognostic chart or operational forecast had been achieved at his Institute of Meteorology in Stockholm on the previous day and another forecast would be prepared in this manner on the current day (March 25) by Norman A. Phillips of the U. S. and G. Dahlquist of Denmark using a Swedish computer "BESC" or "Binary Electric Sequence Computer." Rossby expected verification to equal that of "expert" meteorologists. *Subject Headings:* **1. Numerical forecasting 2. Operational forecasts 3. Electronic computers 4. Stockholm, Sweden.**—*M.R.*

6.6–108 551.509.312 551.509.33

Weather forecasting. *Nature,* London, 174(4432):673–675, Oct. 9, **1954. DWB**—Summary of discussion at British Association, Sept. 6, 1954. R. C. Sutcliffe opened by explaining the complex physical problems involved, mainly hydrodynamical over a great range of scale. V. R. Coles described the work of a practicing forecaster, adding that if much greater accuracy is to come, it will probably be by electronic calculation. J. M. Stagg

considered extended forecasting. Periodicities and correlation are of little value; dynamical-synoptic studies using means for periods of days are more hopeful. C.-G. Rossby dealt hopefully with forecasting by electronic calculation, but this could only give the broad synoptic situation. *Subject Headings:* **1. Numerical forecasting 2. Extended forecasting. I. Sutcliffe, R. C. II. Coles, V. R. III. Stagg, J. M. IV. Rossby, C.-G.**—*C.E.P.B.*

6.6–109 551.509.312

Wippermann, F. (*Frankfurt a.M.*), **Razvoj metode numeričke prognoze posle rata.** [Development of numerical forecasting since the war.] *Yugoslavia. Hidrometeorološka Služba, Vesnik*, 3(1/2):1-2, Jan./June **1954. DWB**—Summary of a lecture reviewing the progress of numerical forecasting since an objective method of forecasting was first formulated by V. Bjerknes in 1904, up to the latest accomplishments at Princeton, Stockholm and elsewhere. *Subject Headings:* **1. Numerical forecasting 2. Progress in meteorology.**—*G.T.*

6.6–110 551.509.317:551.515

§Austin, James M. et al. (*Dept. of Met., M.I.T.*), **Aspects of intensification and motion of wintertime 500-mb patterns.** *American Meteorological Society, Bulletin*, 34(9):383 392, Nov. **1953.** 6 figs., 5 tables, 8 refs. **MH-BH**—The results of an empirical study of 500-mb patterns are presented. It is shown that the prediction of the 24-hr and 48-hr intensification or weakening of troughs and ridges can be aided by a consideration of upstream changes. Qualitative rules for the prediction of a 24-hr change in the speed of troughs and ridges are included. Finally, a climatological summary is presented of intensification, weakening and speed of troughs and ridges. *Subject Headings:* **1. Troughs and ridges 2. Objective forecasting.**—*Authors' abstract.*

6.6–111 551.509.317

§Canada. Meteorological Div., **Interpretation of data on CAO frontal contour and upper air charts.** *Canada. Meteorological Div., Cir-2433*, TEC-180, Feb. 12, **1954.** 6 p. 3 figs. (1 fold.), 2 refs. **DWB**—A model which has been adopted by the Canadian Central Analysis Office for use on upper air charts and frontal contour charts is presented and its application illustrated by an actual example of a chart. *Subject Headings:* **1. Frontal contour charts 2. Station plotting models 3. Upper air analysis.**—*M.R.*

6.6–112 551.509.317:551.515.8

Great Britain. Meteorological Office, **Frontal analysis in the higher troposphere and the lower stratosphere.** *Meteorological Magazine*, London, 83(981):83–90, March **1954. MH-BH**—Discussion of: Berggren, R., **On frontal analysis in the higher troposphere and lower stratosphere** (*see item* 5D–220, April 1954, *MAB*), opened by C. L. Hawson. A number of speakers raised criticisms on points of detail, and doubt was expressed on the reality of fronts above 10,000 ft. E. Gold discussed the cause of low relative humidities in the stratosphere. *Subject Headings:* **1. Upper air analysis. I. Hawson, C. L.**—*C.E.P.B.*

6.6–113 551.509.317:551.509.54

Krown, L., **Detailed radiosonde analysis in local 12-hour forecasting of precipitation at Lydda Airport.** *Israel. Meteorological Service, Series A, Meteorological Notes*, No. 8, **1953.** 8 p. 4 tables. **DWB**—The precipitation index I of I. I. Schell (1946) was applied at Lydda with some adaptations. $I = w/L$, where w is mixing ratio and L = pressure fall in cb during ascent to saturation level. Average index AI is average I up to 600 mb. Values of I and AI were correlated with precipitation in following 12 hours and simple forecasting rules formulated These were successful in 94% of 154 cases. Suggestions are made for further research. *Subject Headings:* **1. Rainfall forecasting 2. Lydda, Israel I. Schell, I. I.**—*C.E.P.B.*

6.6–114 551.509.317

§†Nosske, Gerhard, **Die Energieverteilung in der Troposphäre synoptisch betrachtet.** [The energy distribution in the troposphere from a synoptic point of view.] *Leipzig. Universität. Physikalisches Institut, Veröffentlichungen, Ser. 2*, 16(3):425-472, **1953.** 35 charts, 3 figs., 11 refs., eqs. **DWB**—Air masses are differentiated and fronts located by the energy (*see*

Sonntag, *item* 5.8–32, Aug. 1954 and Sinz, *item* 5.8–31, Aug. 1954, *MAB*) gradient on the 80 mb chart instead of from surface pressure chart characteristics. Several European summer, autumn and winter synoptic series are analyzed according to this scheme and the surface and 500 mb charts presented for comparison with the energy charts. *Subject Headings:* **1. Synoptic aerological studies 2. Etagram analysis. I. Sonntag, Dietrich II. Sinz, Heinz.**—*M.R.*

6.6–115 551.509.318(234.3)

Gressel, Walter, **Zur Aufstellung eines synoptischen Kalendariums für den Alpenraum.** [On the construction of a synoptic calendar for the Alpine region.] *Meteorologische Rundschau*, 7(9/10):170–174, Sept./Oct. **1954.** 7 refs. **DWB**—A list of letter symbols is given to represent the daily development of the general situation over the Alps (pressure and wind systems). It is devised to show the continuity of development. For climatic classification the symbols can be reduced to 20. Examples are given for groups of days in 1950 and 1953. *Subject Headings:* **1. Weather types 2. Alps.**—*C.E.P.B.*

6.6–116 551.509.318:37

Mügge, Ratje and Wachter, H., **Die Hauptarten des Wetters.** [The principal weather types.] Frankfurt a.M., Institut für Meteorologie und Geophysik der Universität, **1952.** 3 pieces. figs., refs. For use with: *Göttingen. Institut für Film und Bild in Wissenschaft und Unterricht, Hochschulfilm*, C577/1950, C578/1950 and C579/1950. **DWB**—These pamphlets contain explanatory notes commenting on educational films in which weather types and their developments are shown in animated cross sections (**Der schnelle Wettertyp.** [High-index weather type], Film No. 577 and **Der langsame Wettertyp** [Low-index weather type], Film C 579) and in accelerated-motion pictures of actual cloud and other observations (**Wetter und Wolken beim schnellen Wettertyp** [Weather and clouds of the high-index weather type], Film No. C 578). The fourth and last pamphlet in the series (**Wetter und Wolken beim langsamen Wettertyp** [Weather and clouds of the low-index weather type], Film No. C/580/1950) was not consulted. *Subject Headings:* **1. Weather types 2. Educational films 3. Teaching of meteorology.**—*G.T.*

6.6–117 551.509.33:551.521.13

Abbot, C. G., **Forecasting weather from solar radiation.** *Nature*, London, 173(4410):880, May 8, **1954. DLC**—Reply to review by C. E. P. Brooks (*see* 5.6–74, June 1954, *MAB*) claiming the existence of more than 20 periodicities in weather, all submultiples of 22¾ years. *Subject Headings:* **1. Long range forecasting 2. Solar constant.**—*C.E.P.B.*

6.6–118 551.509.33:517.512.2(753)

*Abbot, Charles Greeley (*Research Assoc., Smithsonian Inst.*), **Washington, D. C., precipitation of 1953 and 1954.** *Smithsonian Miscellaneous Collection*, 122(13), April 20, **1954.** 4 p. figs., table, ref. **DLC**—The period 1924–41 was used in order to find preferred days for precipitation within the solar rotation cycle of 27.0074 days. Observations during 1952 and 1953 disagree with this cycle, but a prediction for 1954 is given in the hope that this year it will fit better. The temperature prediction on the basis of a cycle of 6.6485 days is discontinued, stating that such prediction would be of doubtful interest. *Subject Headings:* **1. Long range forecasting 2. Precipitation cycles 3. Washington, D. C.**—*A.A.*

6.6–119 551.509.33:551.577.38:551.579

Debski, Kazimierz, **Rozwazánia na temat metod przewidywania posuchy.** [Remarks on methods of prediction of hydrologic drought.] *Przegląd Meteorologiczny i Hydrologiczny*, 5(3/4):96–115, **1952.** 3 figs., 3 tables. English summary p. 113. **DWB**—A paper in which the author takes up successively the following problems: 1) The mechanism of drought development and its division into phases; 2) Drought forecasting, meteorological and hydrological forecasting, probability of lows; 3) Ground water level observations as a means of forecasting, diagrams of ground water level variations, ground water in 1931–1934; 4) Dependence of summer low levels on the discharge of the preceding autumn, the dry years of 1920–1922 and 1951–1952. The hydrologic drought does not occur simultaneously with the

atmospheric drought; it always comes later. Scantiness of soil moisture should be distinguished from exhaustion of ground water. Drying out of soil appears earliest, low water of rivers appear latest. A hydrologic forecast requires sufficient meteorological and hydrological data and a knowledge of the country's physiography. *Subject Headings:* **1. Drought forecasting 2. Hydrologic forecasting 3. Ground water variations.**—*A.M.P.*

6.6–120 551.509.33:551.513.7:519.241.1

Grant, Alison M. (*Met. Dept., Melbourne Univ.*), **Estimating the bias of correlation coefficients.** *Indian Journal of Meteorology and Geophysics*, 4(4):343–346, Oct. **1953.** 2 tables, 6 refs. **MH-BH**—To estimate true correlation (converted to Fisher's z) for seasonal forecasting, account must be taken of the sampling error. An approximate expression is given for the ith highest of m normally distributed coefficients, and tabulated for $m=1$ to 1000 and $i=1$ to 100. Assuming that the highest observed coefficients include the largest sampling errors, a reduction factor is given for obtaining unbiased estimates of z. This is applied to the relations used in G. T. WALKER's forecasting formulas, the mean theoretical bias being calculated as 0.40. *Subject Headings:* **1. Correlation coefficients 2. Seasonal forecasting 3. India.**—*C.E.P.B.*

6.6–121 551.509.33:551.473

§Namias, Jerome, **Further aspects of month-to-month persistence in the mid-troposphere.** *American Meteorological Society, Bulletin*, 35(3):112–117, March **1954.** 18 figs., 9 refs. **MH-BH**—Charts showing isopleths of one month (e.g., Dec.–Jan.) lag correlation between mean monthly heights of the 700 mb surface for 19-year period (1932–1951) are presented and discussed. Certain "favored" areas for high correlation coefficient are noted and explained in terms of ocean or snow surfaces which favor persistence in month-to-month pressure patterns. Seasonal variations in persistence areas are discussed and the stability of these areas in any given month-to-month period shown by comparing 1932–51 sea level lag correlations with 1899–1953 to see if preferred area vary from one decade to another. General similarity of 2 patterns (in Dec.–Jan. log) is evident. *Subject Headings:* **1. Long range forecasting 2. Lag correlations 3. Constant pressure height persistence.**—*M.R.*

6.6–122 551.509.34:551.521.2:551.524.36

Roberts, E. D., **Night cooling under clear skies at Mildenhall.** *Meteorological Magazine*, London, 84(992):48–51, Feb. **1955.** 2 figs., ref. **DWB**—Method of W. E. SAUNDERS (*see item* 4.2–60, Feb. 1953, *MAB*) is applied to forecasting night minimum temperatures at Mildenhall. Graphs are given for Oct.–March and April–Sept. Results are reasonably good. *Subject Headings:* **1. Radiational cooling 2. Nocturnal cooling 3. Local forecasting 4. Mildenhall, England.**—*C.E.P.B.*

6.6–123 551.509.5:551.515.4:551.576.1

Hauer, Hans, **Einige synoptische Überlegungen für den Alpennordrand.** [Some synoptic thoughts for the northern Alpine border.] *Meteorologische Rundschau*, 7(11/12):203–205, Nov./Dec. **1954.** 7 refs. **MH-BH**—1. Prognostic value of Altocumulus castellatus for heat thunderstorms. Of 193 mornings with Ac cast. at Zugspitze but without CuNb or fronts, 60% were followed by thunder or showers. Ci or CiCu were followed by thunder in half the cases. 2. Spontaneous development of convection clouds in the morning in relation to subsequent thunder. Of 121 undisturbed days with $\frac{5}{8}$ or more convection cloud at Zugspitze less than 40% had thunder or showers. *Subject Headings:* **1. Thunderstorm forecasting 2. Zugspitze, Germany.**—*C.E.P.B.*

6.6–124 551.509.52:551.553.11

Watts, A. J., **Sea-breeze at Thorney Island.** *Meteorological Magazine*, London, 84(992):42–48, Feb. **1955.** 5 figs. **DWB**—A method of forecasting sea breeze when gradient wind is off-shore is described, using excess of land air temperature over inshore sea surface temperature. Graphs show occurrence or non-occurrence of sea breeze at Thorney Island plotted against excess land temperature and wind at 3000 ft. Other graphs show time of onset. Effect of stability is shown in typical examples. *Subject Headings:* **1. Sea breeze forecasting 2. Thorney Island, England.**—*C.E.P.B.*

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6.6–125 551.509.6:551.577.3

Toma, Ádám, **Az aszály elleni harcunk haladó hagyományai.** [Progressive traditions o fight against drought in Hungary.] *Természet és Technika*, Budapest, 112(2):101–103 Feb. **1953.** illus., graph. **DLC**—Evidence of the climatic effect of forests and shelter belt referred to in early Hungarian literature is reviewed. Shelter belts were planted on a larg estate in central Hungary in the early 19th century. A report on their effect on climate an crops can be found in *Erdészeti Lapok*, No. 8: 297, 1863. Afforestation as a means o protection against wind and improvement of pastures was also recommended by SZÉCHENY (1846), one of the outstanding economic and political figures of his time. *Subject Headings* **1. Drought amelioration 2. Shelter belts 3. Hungary.**—*G.T.*

6.6–126 551.509.62:551.588.

†Dzerdzeevskiĭ, B. L., **Puti preobrazovaniia klimaticheskikh usloviĭ Prikaspiia.** [Method for changing the climatic conditions in the Caspian Region.] *Akademiia Nauk SSSR Izvestiia, Ser. Geograficheskaia*, No. 1:3–13, **1952.** 3 figs., 4 tables, 39 refs. **DLC**—A review and a digest of Russian literature dealing with the role of the underlying surface on the forma tion and development of climate in the Caspian region are presented and discussed. The material quoted confirms the thesis upheld by the author that all causes determining the climatic peculiarities of the region and its aridity are created by the whole complex of circula tion, radiation and physico-geographical conditions, among which conditions of the "under lying surface" are of considerable importance. Therefore all measures undertaken with the aim of changing the underlying surface are bound to be reflected in an alteration of climat conditions of the lower atmospheric layers. Tables showing regional and radiation balanc from April to Oct. for different stations of the Lower Volga region (B. M. GALPERIN) ar presented and diurnal variations of microclimatic differences between an irrigated areas an dry steppe (air temperature and relative humidity) at 20 m and 150 m and diurnal variation of heat flux from the soil to the air in clear, cloudy and variable weather are graphed. *Subjec Headings:* **1. Climatic amelioration 2. Heat balance control 3. Irrigation 4. Caspian Region, U.S.S.R.**—*A.M.P*

6.6–127 551.509.67

Advisory Committee on Weather Control. *Weatherwise*, 7(1):11–22, Feb. **1954.** photo **MH-BH.** Also: **Congress seeks advice on rain-making legislation.** *Science News Letter* Wash., D. C., 64(8):125, Aug. 22, **1953. DWB**—The first article lists the membership of the Committee on Weather Control appointed by PRES. EISENHOWER under Public Law 256, 83rd Congress, Aug. 13, 1953. Civilian members (K. C. SPENGLER, J. J. GEORGE, LEWIS W. DOUGLAS, A. M. EBERLE and HOWARD T. ORVILLE, CHAIRMAN) are shown in a photograph. Aims of the Committee are outlined. The second article is a short note on the establishment of the Committee. A final report is to be submitted by 1956. *Subject Headings:* **1. U. S. Advisory Committee on Weather Control 2. United States. I. Orville, Howard T.**—*M.R., A.A.*

6.6–128 551.509.67:551.574.1

Banerji, S. K., **Rain-making. The 12th Acharya Jagadish Chandra Bose Memorial Lecture, with Director's Report presented to the 33rd Anniversary meeting of the Bose Institute, Nov. 30, 1950.** Prabasi Press, **1950.** 29 p. 3 figs., tables. **DWB**—The author deals with the physics of drop growth and rain formation, evaporation, the condensation theory of rain drop growth, BERGERON's theory involving the formation of ice crystals on supercooling, LANGMUIR's work on the growth of cloud droplets by accretion, and FINDEISEN's work on the production of ice-forming nuclei during the sublimation of water vapor on to a growing crystal. The use of dry ice cloud seeding to produce rainfall, the experiments on artificial seedings carried out in Australia, Hawaii and South Africa, the best position in the cloud for seeding to obtain optimum results, the effect of seeding on the track of cyclonic storms and the importance of artificial rain in India are discussed. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding 3. Cloud physics 4. India.**—*I.L.D.*

6.6–129 551.509.67

Fea, Giorgio et al., **Esperienze di provocazione artificiale della pioggia.** [Experiments in the artificial production of rain.] *Rivista di Meteorologia Aeronautica*, 13(1):3–15, Jan./March **1953.** 12 figs., 10 refs. Italian, French, German and English summaries p. 3. **MH-BH**—A carefully planned attempt at inducing precipitation on the Sila Grande plateau (southern tip of Italy near Monte Scuro) is described and illustrated in detail. Laboratory experiments and climatological studies (monthly roses of winds aloft and total precipitation in region for season, average monthly height of zero isotherm, etc.) were carried out to determine the most effective manner, time and place for seeding and the most favorable synoptic situations. A topographic map and schematic cross section show cloud-silver iodide-zero isotherm and precipitation mechanics. Details of the 6 attempts (Oct. 22 to Nov. 4, 1952?) and results of each are given with comment that they turned out as expected. However, in order to give quantitative statistical evaluation of success, a rain gage network 5 to 10 times as dense (1 to 4 km²) as that used would be desirable. *Subject Headings:* **1. Artificial precipitation effectiveness 2. Cloud seeding experiments 3. Cloud seeding with silver iodide 4. Sila Grande Plateau, Italy.**—*M.R.*

6.6–130 551.509.67:34

Harvard Univ. Graduate School of Public Administration, **Regulation of weather modification activities.** A report prepared in the Seminar in Land Use and Conservation, Graduate School of Public Administration, Harvard University. May **1952.** 50 p. **DWB**—The legal basis for the regulation of weather modification activities and the legal problems arising therefrom are examined from a strictly legal point of view. On the assumption that a Weather Control Commission has been established in accordance with the provision of the bill introduced by SEN. CLINTON F. ANDERSON in the 82nd Congress (S.222), the author examined the legal bases of the federal and state power to regulate weather modification activity and the relation of the Weather Control Act of 1952 to state regulation of weather modification; and outlined the proposed organization and proposed regulations of the U. S. Weather Control Commission. *Subject Headings:* **1. Weather modification 2. U. S. Weather Control Committee.**—*I.L.D.*

6.6–131 551.509.67

*Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Evaluation of cloud seeding in the Adroscoggin River Watershed for The Brown Company, Nov.–Dec. 1952.** Feb. 5, **1953.** 28 p. 2 maps (fold.), numerous charts (fold.). **DWB**—The trials which began Nov. 1 and ended Dec. 14, 1952 were made in the catchment areas above Berlin, N. H. Four fixed AgI generator stations were in operation during this period, but two more stations were established west of the area and one on Mt. Washington during mid-Nov., and the one to the east in Maine was discontinued at that time. Two mobile units were also used in the evaluation. Weather situations are described for each case and detailed charts show precipitation which occurred in the area. In each case a comment is made as to the probable effectiveness for particular generators or particular rainstorms. *Subject Headings:* **1. Cloud seeding evaluation 2. Silver iodide generator stations 3. Androscoggin Watershed, N. H.**—*M.R.*

6.6–132 551.509.67:632.187

Howell, Wallace E., Associates, Inc., Cambridge, Mass., **Rainfall stimulation in connection with forest fire control, Forestville, Quebec, August 1953.** Oct. 7, **1953.** 1 p. chart. **DWB**—Cloud seeding with AgI was carried out from Aug. 12 to 23, 1953 in the Forestville, Quebec area, in an attempt at controlling a forest fire. Chart shows isohyets of rainfall on Aug. 22–24 in relation to fire area. Success was claimed to the extent that outside the seeding area $<.10''$ of rain occurred whereas $>.25$ up to $.92''$ fell "within the area of stimulation and near the fire." *Subject Headings:* **1. Cloud seeding with silver iodide 2. Forest fire control 3. Forestville, Quebec.**—*M.R.*

6.6–133 551.509.67

Krick, Irving P. (*Water Resources Development Corp., Denver*), **Evidence of man-made climatic change.** *Western Snow Conference, 21st, Boise, Idaho, April 1953*, p. 11–16. [pub.

1953?] Discussion by Milton S. Sachs, p. 17–18. charts, ref. **DWB**—Deals with weather modification by cloud seeding. Seeding operations on the water divide of the Colorado, Arkansas and Rio Grande Rivers, extended over three years, resulted in a remarkable increase in snow pack up to 350% in a single year and up to 288% on the average, while neighboring areas received in some cases, less than ever observed. Maps show the percentage in each year in relation to the normal water content of the snow. No original data are presented. SACHS points out that an independent evaluation committee found even a greater benefit than the operator claimed. *Subject Headings:* **1. Cloud seeding evaluation 2. Colorado. I. Sachs, Milton S.**—*A.A.*

6.6–134 551.509.67:551.579.1:63

Krick, Irving P., **Weather modification and its value to agriculture and water supply.** *Royal Society of Arts, Journal*, 102(4924):447–468, April 30, **1954.** 8 figs., 8 refs. Discussion p. 465–468. **GB-MO**—A brief history is given of attempts at artificial precipitation, and author's experiments are described. The principles, technique and operational control of nucleation by silver iodide are set out and the assessment of the results described. Rio Alberche (Spain) is used as an example. Benefits of cloud seeding in herbage production and increasing snow store for water supply, are described and results of 200,000 hours of cloud seeding summarized. *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding 3. Rio Alberche, Spain.**—*C.E.P.B.*

6.6–135 551.509.67:398

McCarthy, Frederick D., **Aboriginal rain-makers.** *Weather*, 8(3):72–77, March **1953.** 4 figs. **DWB.** Also his article of same title in *Nature*, London, 170(4314):26–27, **1952. DWB.** Also his article of same title, pt. 1, in *Australian Museum Magazine*, Sydney, 10(8):249–252, Dec. 15, **1951** and pt. 2, *Ibid.*, 10(9):302–305, March **1952.** photos. **DLC**—Description of rain-making rites in Australia, with photos, cult of the rainbow-serpent, blood-sprinkling, etc. and also rites for stopping rain. *Subject Headings:* **1. Artificial precipitation 2. Folklore.**—*C.E.P.B.*

6.6–136 551.509.67:551.510.42

Meteor dust "makes" rain. *Science News Letter*, 65(4):55, Jan. 23, **1954. DLC**—Popular review of new theory of E. G. BOWEN regarding the rainfall singularities and their possible cause, seeding by slowly settling meteoric dust from showers occurring 29–30 days sooner. *Subject Headings:* **1. Meteoric dust 2. Rainfall singularities. I. Bowen, E. G.**—*M.R.*

6.6–137 551.509.67

Piriz, Nestor A., **Lluvia artificial en el Uruguay.** [Artificial rain in Uruguay.] *Revista Orientación Meteorológica*, Montevideo, No. 7:33–34, June **1954. MH-BH**—Rainmaking experiments in Uruguay are conducted with a novel technique described in this article. The technique is based on the fact that if the electron equilibrium in a cloud is disturbed, a sudden growth of the cloud droplets by coalescence may ensue. Since clouds have a negative charge, the introduction of a positive field will lead to the desired effect. This is achieved by means of ionized aluminum powder exploded in the cloud. On April 10, 1954 rain was produced from a stratocumulus (showing little promise of rain) over an area several km in diameter. This experiment was carried out before a selected audience comprising public figures and representatives of press and radio. *Subject Headings:* **1. Cloud seeding with ionized aluminum 2. Uruguay.**—*G.T.*

6.6–138 551.509.67:551.578.7

Ruby, F., **Les nouvelles méthodes de défense contre la grêle.** [New methods of hail prevention.] *La Météorologie*, Paris, 4th Ser. No. 29:61–72, Jan./March **1953.** French, English and Spanish summaries p. 61. **MH-BH**—The physics of hail formation is first discussed in detail and then several methods of hail prevention, including the old method of hail shooting (rockets, etc.) which was said to be 50 to 60% successful, and a new method of including AgI in the explosive charge of the rocket (rather than the inefficient ground generators)

so that it would cause the cloud to precipitate prematurely, i.e., before the violent hail eddies had developed. Results obtained by the author and Météorologie Nationale since 1936, which are available in detail, are summarized. Author claims 100% success when AgI rockets are used (both for hail prevention and rain making). *Subject Headings:* **1. Hail shooting 2. Artificial precipitation 3. Silver iodide rockets 4. France.**—*M.R.*

6.6–139 551.509.67

U. S. Congress. House. Committee on Appropriations, **Third supplemental appropriation bill, 1954. Hearing before subcommittees, 83rd Congress, Second Session.** Washington, D. C., Govt. Print. Off., **1954.** p. 182–194 treat requested budget for the Advisory Committee on Weather Control. **DLC**—Transactions of the hearing of the Senate Subcommittee on appropriations, wherein H. T. ORVILLE, chairman of the Advisory Committee on Weather Control answered questions on the scope of work contemplated by his committee for the next 2 years, and gave an outline of proposed expenditures and justification for various items in his budget, proposed staff, travel, etc. The initial work by a small staff of experts, working with the Advisory Committee, will be to collect reports and data on cloud seeding activities in the U. S. and possibly abroad and to evaluate the effectiveness of these efforts (both beneficial and detrimental) with a view toward recommending Federal legislation to control such activities if found necessary. *Subject Headings:* **1. U. S. Weather Control Committee 2. Cloud seeding evaluation 3. Weather control hearings.**—*M.R.*

6.6–140 551.509.67

Vernon, Edward M., **Report on classification of storms for statistical evaluation with special reference to the Carrizo Plains and the Santa Maria coastal area.** Submitted to California Dept. of Public Works, Div. of Water Resources. Feb. 26, **1953.** 29 p. 9 figs. Photostat of typescript. **DWB**—A simple scheme was devised for classifying storms moving from the Pacific onto the California Coast whereby the rainfall in a target area would differ from that in a central area between one type and the other (or others). In this study, 2 types were recognized: 1) High Index and 2) Low Index (based on pressure differences from north to south along the Calif. Coast). Examples are given and rainfall in various areas affected by the storms described. Regressions are computed for target against central area of precipitation and it is shown how a cloud seeder could show very high success if he seeded only during Type I storms and would fail if he seeded Type II storms—even if the seemingly statistically sound target-central area system of evaluation were used. A greater degree of differentiation is possible by using a more refined "air flow" or synoptic classification. *Subject Headings:* **1. Cyclonic types 2. Cloud seeding 3. Storm classification 4. California Coast.** —*M.R.*

6.6–141 551.509.9:551.510.42:6

American Meteorological Society. Air Pollution Abatement Committee, **A statement on the present possibilities of applying meteorology in air-pollution abatement.** *American Meteorological Society, Bulletin,* 34(1):38–40, Jan. **1953. DWB**—Concise review of meteorological factors affecting air pollution, discussing the influence of regional and local weather and climate and summarizing possible meteorological contributions to city planning, design and operation of plants. *Subject Headings:* **1. Atmospheric pollution control 2. Industrial meteorology 3. City planning. I. Hewson, E. W.**—*A.A.*

6.6–142 551.509.9:551.510.42

Munns, J. J. (*Weirton Steel Co.*), **The Weirton Air Pollution Program.** *Air Repair,* Pittsburgh, 3(3):170–172, Feb. **1954. DWB**—The Weirton air pollution program includes: (1) A technical program covering a) a community dustfall and gas survey, b) a stack emission survey and c) an engineering program; (2) A public relations program covering a) dispensing of general information, b) information on the program and c) progress reports to the community. Each of these points is briefly discussed. Under point (1a) wind conditions of Weirton are mentioned, and monthly values of wind direction and velocity are tabulated for 1950–51. *Subject Headings:* **1. Atmospheric pollution control 2. Weirton, W. Va.**—*G.T.*

STRUCTURE AND PHYSICS OF THE ATMOSPHERE

ATMOSPHERIC POLLUTION

See also: **Negative ions** (Massey), 6.6–3; **Electronic & ionic impact phenomena** (Massey), 6.6–4.

6.6–143 551.510.42:628.53

Best, A. C., **Assessment of maximum concentration at ground level of gas from a heated elevated source.** *Great Britain. Meteorological Research Committee, M.R.P.*, 878, Sept. 20, 1954. 11 p. 3 figs., 4 tables, 3 refs., 26 eqs. Mimeo. **DWB**—Three formulas (O. G. Sutton; Bosanquet, Carey and Halton; and Oak Ridge) for computing maximum gas concentration at ground from a high hot chimney are compared. The differences in computed values are small and are mainly due to differences in computing the rise of the smoke plume above the orifice. A combination of the Oak Ridge empirical and Sutton's formula is recommended. *Subject Heading:* **1. Stack effluents.**—*C.E.P.B.*

6.6–144 551.510.42:551.575.1

Kelley, A. L., **Fog and smog.** *Smokeless Air*, No. 89:137–141, 144, Spring **1954.** fig., table. **DWB**—Popular account of the causes of natural fog and smoke fog (below inversions), with special reference to Birmingham district. Statistics are given and discussed. *Subject Headings:* **1. Fog 2. Smog 3. Birmingham, England.**—*C.E.P.B.*

6.6–145 551.510.42:628.53

McDaniel, W. N. (*Light & Power Co., Balto., Md.*), **Compensation for gas emission velocity in calculations of stack gas dispersion.** *Air Repair*, Pittsburgh, 3(3):188–194, Feb. **1954.** 6 figs., 13 refs., 27 eqs. **DWB**—It is generally recognized that the ground-level concentration of material normally emitted from a stack is reduced if the stack height or stack gas velocity is increased. This is usually considered to mean that stack gas velocity may be substituted for stack height if the circumstances require it. This paper proposes a method of calculation by which the stack-height-equivalent of gas emission velocity may be determined. The theory of the proposed calculation is presented in detail, and the solution to a specific problem is given by means of four curves. *Subject Headings:* **1. Atmospheric pollution 2. Stack effluents.**—*From author's abstract.*

6.6–146 551.510.42:628.53

Mallette, Frederick S., **A new frontier: air pollution control.** *Smokeless Air*, London, 24(91):32–46, Autumn **1954.** 4 figs., table, 16 refs. **DWB**—Abstracts from a paper read to the Institution of Mechanical Engineers, April 23, 1954. It deals first with investigations and regulations in St. Louis, Pittsburgh and Allegheny Co., New York City, California and Los Angeles, and the resulting improvement in conditions. Research in California is described in detail and that in Canada summarized. *Subject Heading:* **1. Smoke abatement.**—*C.E.P.B.*

6.6–147 551.510.42:551.21

Muller, Ernst H.; Juhle, Werner and Coulter, Henry W., **Current volcanic activity in Katmai National Monument.** *Science*, 119(3088):319–321, March 5, **1954.** fig., 7 refs. **DWB**—Volcanic eruptions in the northern Aleutian Peninsula early in July 1953 together with favorable winds caused ¼ in. of volcanic ash to settle on Anchorage, Alaska, with disruption of power, water supply and air traffic. Later eruptions, including height of cloud of steam (30–35 thousand feet) and visibility restrictions at great distance from the source of eruption, are described. This series of eruptions does not compare in magnitude with the eruption of Katmai in June 1912. *Subject Headings:* **1. Volcanic dust 2. Volcanic eruptions 3. Aleutian Peninsula.**—*M.R.*

6.6–148 551.510.42

Neiburger, Morris and Edinger, James G., **Summary report on meteorology of the Los Angeles Basin with particular respect to the "smog" problem.** *Southern California Air Pollution Foundation, Los Angeles, Report*, No. 1, April **1954.** 54+p. 43 figs., 12 tables,

15 refs. **MH-BH**—A most thorough and detailed study of basic factors which lead to a high concentration of pollution in the Los Angeles Basin. The subtropical inversion which is accentuated by the cold surface waters off the Californian coast is the contributing factor. Detailed analysis of wind movements from surface and upper air observations, radiation conditions and inversion structure from radiosondes are presented in text with dozens of graphs and charts showing structure of wind and air masses, and tables showing frequencies of the various factors and their interrelationships and relation to smog days. For instance, the diurnal and day to day variations in height of inversion base, as well as seasonal variations are shown graphically for the Los Angeles region and for the entire Pacific Coast area. Also charts show trajectories of air parcels moving from sources to complaint areas. *Subject Headings:* **1. Atmospheric pollution microclimatic surveys 2. Wind structure 3. Temperature inversions 4. Los Angeles Area, Calif.**—*M.R.*

6.6–149 551.510.42:001.4

The origin of "smog." The problem in 1905. *Smokeless Air*, London, 24(91):12–13, Autumn **1954. DWB**—Term was coined by H. Des Voeux in 1904 (*Daily Express*, July 26, 1905). Quoted in U. S. in *New York Herald*, July 30. *Subject Headings:* **1. Smog 2. Terminology. I. Des Voeux, H.**—*C.E.P.B.*

6.6–150 551.510.42:551.575

Pilpel, N., **Contaminated fogs.** *Research*, London, 6(12):481–485, Dec. **1953.** 4 figs., 14 refs. **DLC**—The interaction between air pollution and meteorological conditions to form contaminated fog is discussed. The physico-chemical nature of fog, the various methods of fog dispersal, namely, increase in the evaporation rate of fog and in the coagulation rate of droplets and the precipitation of atmospheric fog by surface active agents are considered. *Subject Headings:* **1. Atmospheric pollution 2. Fog 3. Fog dissipation.**—*I.L.D.*

6.6–151 551.510.42:551.575.1

Scorer, Robert S., **Smog.** *Science Progress*, 42(167):396–405, July **1954.** 4 figs., 4 refs. **DLC**—Discusses in simple terms the seriousness of the smog problem, effect of solid particles in forming inversions and as condensation nuclei, sources, effects and potential danger of SO_2, CO and CO_2. Behavior of unwashed and washed smoke plumes is described. Various partial solutions are discussed. *Subject Heading:* **1. Smog.**—*C.E.P.B.*

6.6–152 551.510.42

Sherlock, R. H. and Lesher, E. J., **Atmospheric sanitation.** *Michigan Technic*, 72(4): 14–15,34, Jan. **1954.** 6 photos. **DLC**—A general discussion of atmospheric contaminants from industrial plants and the problems of design of stacks in relation to terrain and other variables such as quantity of contaminant. wind speeds, diffusion coefficients and distance to points where contamination is to be measured are considered. Several Univ. of Michigan wind tunnel experiments with model stacks and plume over rugged or smooth terrain, are illustrated photographically. The downwash of gases over hilly terrain shows up beautifully. Settling of particular matter as well as the aerodynamic and micro-meteorological influences must be considered. *Subject Headings:* **1. Stack meteorology 2. Smoke dispersion 3. Wind tunnel experiments.**—*M.R.*

UPPER ATMOSPHERE—IONOSPHERE

6.6–153 551.510.5:656.7:599.9

Campbell, Paul A. (*U. S. A. F. School of Aviation Medicine*), **Atmospheric characteristics of greatest human significance.** *Aeronautical Engineering Review*, N. Y., 12(4):50–54, April **1953.** 4 figs., 4 refs. **DLC**—A series of schematic cross sections of the atmosphere from sea level to 100,000 ft show, respectively: 1) the normal pressure, temperature, clouds, and weather conditions, and maximum heights of various sounding devices or craft, 2) variations of tropopause with season and latitude, 3) time of useful consciousness at various altitudes, 4) methods of maintaining human oxygen requirements at various altitudes, and 5) temperature, O_3 and cosmic radiation. Physical conditions are first discussed and biological implications for flight

at 50 to 100,000 ft outlined in light of probable realization of those flying altitudes in th near future. *Subject Headings:* **1. Atmospheric models 2. Upper air charts 3. High altitud flying effects on man.**—*M.R.*

6.6–154 551.510.

Colón, José A., (*Met. Dept., Chicago Univ.*), **The mean summer atmosphere of the rain season over the western tropical Pacific Ocean.** *American Meteorological Society, Bulletin* 34(7):333–334, Sept. **1953.** fig., table, 2 refs. **MH-BH**—Using the nighttime observation (1500 Z) from June to Sept. for the period 1944–1947 from Kwajalein, Guam and Palau the author presents a tropical standard atmosphere for the Western Pacific Ocean. A tabl gives the Pacific mean sounding, a comparison with SCHACHT's sounding for the Caribbea and the deviations of the relations used from the mean. The mean tropical atmosphere i summer for the Caribbean and Pacific regions (nighttime conditions) are shown on a tephigram *Subject Headings:* **1. Standard atmosphere 2. Rainy seasons 3. Western Pacific Ocean.**— *I.L.D.*

6.6–155 551.510.

*Gargiulo, Guiseppe, **L'atmosfera tipo ICAO.** [ICAO standard atmosphere.] *Rivista d Meteorologia Aeronautica*, Rome, 13(2/3):19–41, April/Sept. **1953.** 10 figs., tables, eqs Italian, French, English and German summaries. **MH-BH**—The theoretical basis for the ICAO standard atmosphere (−5 to 20 km height) is given *in extenso*, and tables and curves reproduced for the various parameters according to the latest (1952) model. The element included are pressure, temperature, humidity, gas constants, air density, height and tem perature of tropopause, lapse rates of pressure, temperature, density, actual and relative speed of sound, coefficient of viscosity, kinetic viscosity. *Subject Headings:* **1. ICAO standard atmosphere 2. Standard atmosphere 3. Atmospheric constants.**—*M.R.*

6.6–156 551.510.52:621.396

Bremmer, H., **The troposphere as a medium for the propagation of radio waves—I, II.** *Philips Technical Review*, Eindhoven, Netherlands, 15(5,6):148–159; 175–181, Nov., Dec. **1953.** 10 figs., 24 refs., eqs. **DLC**—For microwave (<10 m) propagation the troposphere below 10 km (or the refraction index in the troposphere), not the ionosphere, has proven to be the most critical region of the atmosphere. Knowledge of this troposphere propagation and of the physical characteristics of the troposphere which affect microwaves is reviewed. Six methods by which microwaves are transmitted are examined: a) along 2 normal paths, one direct and one reflected; b) along a few rays via a transition layer; c) superrefraction (along many rays as in a wave guide with the troposphere as the wave guide; d) via reflection due to (temperature and humidity) gradient changes; e) by diffraction and f) by scattering. The last named method is discussed in great detail as it is responsible for interference from distant transmitters and hence is the most important factor in assigning wave lengths and spacing of transmitters in order to avoid interference. *Subject Headings:* **1. Microwave transmission 2. Tropospheric propagation 3. Refractive index.**—*M.R.*

6.6–157 551.510.52:551.511:551.507.352

*James, D. G., **Fine scale characteristics of the lowest 5,000 ft of the atmosphere as observed from an aircraft.** *Great Britain. Meteorological Research Committee, M.R.P.* 875, Aug. 31, **1954.** 27 p. 16 figs., 16 tables, 6 refs. Mimeo. **DWB**—Flights were made on convective days between about 5000 and 500 ft to measure details of gustiness and bumpiness and fluctuations of temperature and dew point. The ultra-rapid instruments are described and the results tabulated in detail. Over land three layers were found: up to 800–1200 ft, chaotic; from this layer to 200–300 ft below cloud base, less frequent and better defined fluctuations; sub-cloud layer, increased stability. Over sea these layers are not found; bumpiness is less and there is often an inversion. It is inferred that during the morning bubbles of heated air rise from the ground and, if moist enough, form cloud. Further ascent warms and deepens the sub-cloud layer and cloud formation proceeds by bubbles from this layer, continuing long

after surface temperature has passed its maximum. *Subject Headings:* **1. Airplane research 2. Convection 3. Lower troposphere.**—*C.E.P.B.*

6.6–158 551.510.52

Lauscher, F., **Die Grundschicht-Typen von K. Schneider-Carius.** [The fundamental layer-types of K. Schneider-Carius.] *Wetter und Leben*, 5(11/12):222–223, Dec. **1953.** fig. **MH-BH**—The author presents a graphic representation of the fundamental troposphere layers discussed in Schneider-Carius, K., **"Die Grundschicht der Troposphäre"** (*see item* 5.2–7, Feb. 1954, *MAB*). These layer types are as follows: 1) inversion type; 2) inversion type with mixing layer; 3) high cloud type; 4) normal type; 5) convection type; 6) gusty weather type; 7) dissolution type (thunderstorms, rainy weather). *Subject Headings:* **1. Tropospheric layers 2. Tropospheric types.**—*I.L.D.*

6.6–159 551.510.53:551.508.29:551.524.7

*Elterman, L. (*U. S. A.F.C.R.C., G.R.D., Cambridge, Mass.*), **A series of stratospheric temperature profiles obtained with the searchlight technique.** *Journal of Geophysical Research*, 58(4):519–530, Dec. **1953.** 9 figs., 4 tables, 3 refs. **DLC**—Measurements of atmospheric densities have been made with the searchlight technique, using improved instrumentation. The density distributions are sufficiently accurate so that corresponding temperature profiles are readily obtained. The density-temperature equation requires the evaluation of an integration constant, which is accomplished by using radiosonde information and, in addition, considering physically acceptable temperature lapse rates. Five temperature profiles are obtained which represent stratospheric conditions over New Mexico during Oct. 1952. The average temperature maximum is 313°K. The average temperatures are calculated to 67.6 km. *Subject Headings:* **1. Searchlight soundings 2. Stratospheric temperatures.**—*Author's abstract.*

6.6–160 551.510.53:536.7

H-bomb damage officially bared. *Science News Letter*, Wash., D. C., 65(15):227, April 10, **1954.** photos. **DWB**—Vivid pictures of Nov. 1952 H-bomb cloud are shown: first as it had just pierced the stratosphere and then after it mushroomed out on all sides, with top at about 125,000 ft and tropopause at 50,000 ft. *Subject Headings:* **1. H-bomb clouds 2. Convection in stratosphere 3. Eniwetok, Marshall Islands.**—*M.R.*

MECHANICS AND THERMODYNAMICS OF THE ATMOSPHERE

See also: **Upper air airplane research** (Janies), 6.6–157; **General circulat. of atmos.** (M.I.T.), 6.6–170.

6.6–161 551.511

Garmendia Iraundegui, José, **Algunas observaciones sobre los invariantes en hidrodinámica.** [Comments on hydrodynamic constants.] *Revista de Geofísica*, Madrid, 12(48): 340–343, Oct./Dec. **1953.** 4 refs., 6 eqs. French summary p. 340. **DLC**—The author criticizes the rejection of ERTEL's and ROSSBY's constant by GIRAUD and KIVELIOVITCH (*see item* 5.3–133, March 1954, *MAB*). He arrives at a generalization of said constant and applies it to particular cases. *Subject Headings:* **1. Fluid dynamics 2. Vorticity theory.**—*Trans. of author's abstract.*

6.6–162 551.511:551.46

*Gilcrest, Robert A.; Jung, Glenn H. and Freeman, John C., Jr., **Empirical relations between the weather and the ocean mixed layer.** Texas. A. & M. College. Dept. of Oceanography, Contract N7-onr-48703, Project NR 083-061, Project 29, Technical Report, No. 8, April **1954.** 15 p. 6 figs., 3 tables, bibliog. p. 15. **DWB**—A series of bathythermograph and meteorological observations at North Atlantic Weather Ship "C," 52°45'N, 35°30'W, were analyzed qualitatively with the object of discovering the physical processes concerned in the variation of the mixed layer depth (MLD). An empirical chart (named the Wistab—contraction of "wind stability") relating surface wind speed and air stability to changes in the

mixed layer depth was developed for this purpose. The important processes postulated here—turbulent mixing, wind stirring and evaporative cooling—appear capable of explaining much of the observed change in MLD. A test was made to find the value of the Wistab as a predictor of MLD changes using independent data for the test. A linear correlation coefficient of 0.67 was obtained when relating predicted to observed MLD changes; this correlation is significant at the 5% level. *Subject Headings:* **1. Ocean-atmosphere interaction 2. Energy exchange sea-atmosphere.**—*Authors' abstract.*

6.6–163 551.511:551.543

Haarlaender, Hans, **Stromfelddivergenz und Bodendruckänderung.** [Flow-field divergence and surface pressure change.] *Meteorologische Rundschau*, 7(11/12):201–203, Nov./Dec. **1954.** fig., 10 refs., 23 eqs. **MH-BH**—Physical divergence is analyzed into directional and velocity components. The directional divergence $v(\partial\alpha/\partial n)$ is approximated, with the aid of the Taylor series, to the geostrophic and quasigeostrophic wind field, so that the derivatives of the geopotential can readily be determined from the absolute topography. This enables conclusions to be drawn as to the surface pressure changes resulting from directional divergence. *Subject Headings:* **1. Divergence 2. Pressure changes.**—*Trans. of author's abstract.*

6.6–164 551.511:551.558.1

Lander, A. J. and Robinson, G. D., **On the determination of the vertical convective heat flux by observations of wind and temperature near the ground.** *Great Britain. Meteorological Research Committee, M.R.P.*, 873, Aug. 31, **1954.** 18 p. 8 figs., 4 tables, 15 refs. Mimeo. **DWB**—Earlier measurements at Kew (M.R.P. 740) were continued, mostly at a height of 150 cm, and the complete results are tabulated, including heat flux mw.cm^{-2} calculated from simultaneous fluctuations of vertical components of winds and temperatures, and that given by Bowen ratio. The former averages only 0.44 of the latter. Both methods are discussed and considered to be satisfactory at the Kew site, so that the discrepancies cannot yet be accounted for. SWINBANK's results are also tabulated but do not help. Appendices describe the apparatus and the method of determining heat flux. *Subject Headings:* **1. Convective heat transfer 2. Kew, England.**—*C.E.P.B.*

6.6–165 551.511:551.576.11

Pedgley, D. E., **Medium-level instability.** *Meteorological Magazine*, London, 82(974):249–250, Aug. **1953. MH-BH**—Feb. 26, 1953, at Larkhill, lenticular water-drop ACu changed to flocculent ice-crystal ACu. A contrail through the cloud developed into a fringe of virga. At sunset a mammatus structure was visible. Explanation obscure. *Subject Headings:* **1. Instability 2. Cloud structure 3. Larkhill, England.**—*C.E.P.B.*

6.6–166 551.511

Sakuraba, S. (*Central Met. Obs.*), **On the energetics of horizontal lability, Pt. 3.** *Geophysical Magazine*, Tokyo, 24(1):25–39, Aug. **1952.** 7 figs., 2 refs., eqs. **MH-BH**—RAETHJEN's theory for the formation of convective clouds along upgliding fronts, which was based on dynamical considerations, is examined from the thermodynamical point of view. A critical value of the mixed mass is derived which, depending on the lapse rate, determines the maximum lability of the mixed mass. The author considers dry and wet adiabatic cases and shows the final results of the rather bulky equations in numerical examples. A storm can develop even in a very stable atmosphere due to horizontal lability if the temperature difference is of the order 10°C. (For Pts. 1 and 2 *see item* 6.4–133, April 1955, *MAB*.) *Subject Headings:* **1. Horizontal lability 2. Thermodynamics. I. Raethjen, Paul.**—*A.A.*

6.6–167 551.511

Sato, T., **On the motion uniform in a direction.** *Papers in Meteorology and Geophysics*, Tokyo, 2(3–4):339–342, Dec. **1951.** ref., 14 eqs. **MH-BH**—The author integrates the equations of motion and obtains solutions for momentum and vorticity, assuming that the fluid is frictionless and autobarotropic, the effect of deflecting force is negligible and the state of motion is uniform in one direction. *Subject Headings:* **1. Dynamic meteorology 2. Equations of motion.**—*A.A.*

6.6–168 551.511

Van Mieghem, J. (*Univ. of Brussels*), **Transport and production of vorticity in the atmosphere.** *Tellus*, 6(2):170–176, May 1954. 4 refs., 9 eqs. **MH-BH**—The classical form of the vorticity equation is transformed into an equation of balance from which the vorticity transport and the rate of vorticity production are deduced. Transport and production are given for: 1) an arbitrary component of the absolute vorticity, 2) the absolute vorticity vector, 3) the absolute vorticity flux through a surface, 4) the total absolute vorticity within a volume. Special consideration is given to the absolute vertical vorticity, the absolute vorticity component normal to the isentropic surfaces and the total absolute vertical vorticity of the atmosphere. The influence of vertical motions and of heating and cooling on the vorticity transport are discussed. The sign of the meridional vorticity transport is tentatively determined. *Subject Headings:* **1. Vorticity transport 2. Vertical vorticity 3. Vorticity equations.**—*Author's abstract.*

GENERAL CIRCULATION

See also: **Synoptic forecasting on troposph.** (Oliver & Oliver), 6.6–103; **Correlation coeff.** (Grant), 6.6–120; **Jet stream & tropopause fluctuations** (James, Holzworth), 6.6–173; **Cyclogenesis** (Namias), 6.6–176.

6.6–169 551.513

Breistein, P. M. and Parry, H. D., **Some dynamical aspects of static stability.** Ohio. Univ. Dept. of Meteorology, Contract AF 19(604)-390, Technical Report, No. 2, [1953?]. 15 p. 5 figs., 4 refs., eqs. **DWB**—Two sets of data, one for the Northern Hemisphere as a whole and one for North America, have been used in search for statistical relationships between the static stability (S), and Coriolis parameter (f) and the wave length (L) of the flow patterns at the 500 mb level. Significant correlations were found between L and $S^{\frac{1}{2}}/f$, and also between L and f^{-1}. The variation S along the wave length was examined and systematic variations were found. The second set of data showed results which varied significantly from those pertaining to the hemisphere as a whole, and it is suggested that this, at least in part, may be due to orographical influences, particularly by the Rocky Mountains. The preliminary nature of the results and the need for further investigations are stressed. *Subject Headings:* **1. Stability 2. Coriolis force 3. Dynamics of the atmosphere 4. Northern Hemisphere.**—*Authors' abstract.*

6.6–170 551.513.1:551.511

Massachusetts Institute of Technology, **Investigation of the general circulation of the atmosphere.** Contract W28-099-ac-406, Reports 1–5, June 30, 1948–June 30, 1949. diagr., graphs, charts, tables, refs. **DWB**—Theoretical and statistical studies of the variations of absolute angular momentum over the earth and their effect on the general circulation are described and data, charts, etc. included. Effect of surface friction, mountain ranges, differences between continents and oceans, Northern and Southern Hemispheres, lack of sufficient data for high level computations, estimation of variations in speed of earth's rotation, etc. considered. Work based on calculation for Dec. 1945, Jan., Feb. and March 1946. Also production of kinetic energy is examined. A generalized vorticity equation for a two-dimensional spheric earth has been obtained. *Subject Headings:* **1. Angular momentum balance 2. Momentum transport 3. General circulation 4. Energy balance. I. Starr, Victor P.**—*M.R.*

ATMOSPHERIC DISTURBANCES

See also: **Letter to instructor** (Rodewald, Schröder), 6.6–39; **Sferics from cold fronts** (Kimpara), 6.6–60; **Cyclone forecasting** (Nagayama), 6.6–101; **Wintertime 500 mile pattern** (Austin), 6.6–110; **Upper air analysis** (Gt. Brit. Met. Off.), 6.6–112; **Thunderstorm forecasting** (Hauer), 6.6–123; **Freezing nuclei in different air masses** (Rau), 6.6–260.

6.6–171 551.515:550.342

Heywood, Graham S. P., **Storm microseisms in Hong Kong. Preliminary Report.** *Hong Kong. Royal Observatory, Technical Notes*, No. 9, March 1954. 5 p. fig., 2 refs.

Mimeo. **DWB**—Microseisms with 4 or 5 sec period recorded at the Royal Observatory on Sprengnether ser. H. seismometer recording only E-W movements during June 1952 to De 1953 were analyzed with respect to maximum range occurring within 30 min of each synopt hour when range was >2 min (enhanced microseisms). All synoptic charts and aircra reconnaissance reports were examined and disturbances tabulated in area 10°–30°N and 105 125°E, along with maximum winds and center of disturbance. All enhanced microseism occurred when either monsoon winds (winter), troughs, typhoons, tropical storms or "Kona storms were in the area, but not all such storms produced microseisms. Charts show lin of equal amplitude for severe typhoons, less severe typhoons and tropical storms. Mechanis is uncertain but probably connected with surf. *Subject Headings:* **1. Microseisms from storm 2. Typhoon microseisms 3. Hong Kong 4. China Sea.**—*M.R.*

6.6–172 551.515.1:550.34

Imbert, Bertrand, **Microséismes et houle dans l'Océan Indien sud.** [Microseisms an swells in the South Indian Ocean.] *Annales de Géophysique*, 10(2):175–184, April/June 195 13 figs., 3 tables, 19 refs., eqs. English and German summaries p. 175. **DWB**—Owing to th presence of pack ice, microseisms recorded in Adélie Land must be generated in deep se This is confirmed by an observed relation between periods and depths. The different ocean ographical factors liable to modify the amplitude of microseisms connected with barometr lows are discussed. A relation is found with the velocity of lows and with the rotation winds, especially those associated with cold fronts. The results support the theory of LONGUE HIGGINS according to which microseisms are generated by standing waves at sea. *Subje Headings:* **1. Microseisms 2. Adélie Land 3. South Indian Ocean.**—*Author's abstract.*

6.6–173 551.515.1:551.513.2:551.510.52/

§James, Ralph P. and Holzworth, George C., **Some fluctuations in the jet stream an tropopause associated with cyclonic development and movement, February 18–21, 1954** *Monthly Weather Review*, 82(2):64–72, Feb. **1954.** 16 figs., 4 refs. **DWB**—A synoptic aerological study of a storm which moved from Wyoming to the Great Lakes from Feb. 18 t 21, 1954. The storm intensified greatly during the first part of the period, but did not deepen Tropopause analysis as shown on 12-hourly cross sections from Calif. to Wash., D. C., reveal a rapid lowering (from 40,000 to 26,000 ft and back to 40,000 ft) between Long Beach, Calif Grand Junction, Colorado, and Omaha. This lowering was over a cold dome, and was no accompanied by the tropopause break, "but merely by steep gradients on all sides." Je stream analysis at 200 mb level for 3 days shows decrease and later increase in speed and heigh of jet stream. The only tropical tropopause was at Miami. *Subject Headings:* **1. Synopti aerological studies 2. Tropopause height 3. Jet stream analysis 4. Cyclone movemen 5. Grand Junction, Colo.**—*M.R.*

6.6–174 551.515.

§Kerr, I. S., **Some features of upper level depressions.** *New Zealand. Meteorologica Service, Technical Note*, No. 106, Dec. 17, **1953.** 6 p. 14 figs., 3 tables, 8 refs. **DWB**— The results of an examination of cold pools and upper level depressions observed in the Aus tralia–New Zealand region in the period April 1952 to March 1953, inclusive, are summarized The numbers and movements of cold pools, classified according to origin and history, observe in each of the four seasons are compared with similar statistics for the Northern Hemisphere Some examples of common developments in the sea level pressure field are illustrated and th association of heavy rainfall with upper level depressions is briefly discussed. *Subject Headings* **1. Upper level depressions 2. Cold pools 3. Australia 4. New Zealand.**—*Author's abstrac*

6.6–175 551.515.1:551.54

Mosetti, Ferruccio, **Primi resultati sulla localizzazione delle perturbazioni atmosferich dall'esame delle onde microbariche.** [Preliminary results in locating atmospheric disturb ances by microbaric wave analysis.] *Trieste. Osservatorio Geofisico, Publicazioni, Nuov Serie*, No. 40, **1952.** p. 483–498. 7 figs., tables. English summary p. 498. (Unidentifie reprint.) **DWB**—It is shown how atmospheric disturbances can be located by means of th microbaric waves developed by them. From several examples it appears that the directio

of particular waves recorded by microbarographs correspond exactly to the position of cyclones in respect to the group of recording stations. *Subject Headings:* **1. Cyclone location 2. Microbaric waves 3. Microbarometric cyclone location 4. Trieste.**—*Author's abstract.*

6.6–176 551.515.1:551.513

Namias, Jerome, **Quasi-periodic cyclogenesis in relation to the general circulation. Summary.** (In: American Meteorological Society and Royal Meteorological Society, **Proceedings of the Toronto Meteorological Conference, 1953,** p. 154. pub. 1954. **DWB**—Periodic cyclogenesis is related to 5- and 30-day mean charts; periodicity was often about 10 days. The mechanism in the western U. S. is discussed. (For fuller abstract *see item* 6.2–147, Feb. 1955, *MAB.*) *Subject Heading:* **1. Cyclogenesis.**—*C.E.P.B.*

6.6–177 551.515.1:629.12(261)

Rodewald, M., **Der Atlantick-Orkan von Anfang Oktober 1954.** [The Atlantic hurricane at the beginning of October 1954, Pt. 1.] *Wetterlotse*, No. 78:217–227, Nov. **1954.** fig. Pt. 2, . . . **Das Rennerstadium.** [The rapidly moving stage.]; and Pt. 3, . . . **Das Trödlerstadium.** [The slow stage.] *Ibid.*, No. 81:265–274, Dec. **1954.** 3 figs. **DLC**—Pt. 1—This storm, though originating in subtropics, developed into a typical tropical hurricane. Reported in 48½°N, 30°W on Oct. 5, travelling E. Lowest pressure 969 mb on 6th; pressure curve of "SS. Leipzig" reproduced. Weather and radio warnings summarized and ships' avoiding action discussed. Pt. 2—On Oct. 5 the center lay N of O.W.S. E(35N 48W), 984 mb, with WSW 80 kn, wave height 9½ m. It moved rapidly NNE to 62N 35W at 6 h on 7th. Meanwhile a deepening subpolar low with a marked cold front travelled E to 53N 45W, then irregularly NNE to 58N 40W at noon on 7th (945 mb) and absorbed the hurricane. These unexpected tracks led to inaccurate forecasts. In Pt. 3—the irregular track between 30 and 35N Oct. 1–5 is plotted and discussed. *Subject Headings:* **1. Extratropical cyclones 2. Marine navigation 3. Atlantic Ocean.**—*C.E.P.B.*

6.6–178 551.515.1:551.577(73)

§Schulte-Vennbur, Hermann, **Niederschlagsstrukturen von Zyklonen in Nordamerika.** [Precipitation structure in North American cyclones.] *Geofisica Pura e Applicata*, 26:97–111, **1953.** 5 figs., table, 40 refs. German and English summaries p. 97. **MH-BH**—By evaluating the hourly measurements of the precipitation at 1500 stations in the U.S.A. the distribution and the time variations of intensity of precipitation of 32 North American cyclones during the years 1949 and 1950 are examined. On an average the precipitation areas of these cyclones have their larger surface and yield to the left of the path of the centers. A closed spur of the precipitation area is led around to the left of the low pressure. The fronts and their precipitation have no direct connection to the real precipitation area of the cyclones. The structure of the lefthand quadrants of the cyclone is discussed, considerable upslide motion is required to explain the phenomena in this portion. This concept is supported by theoretical consideration. Strong variations occur in the precipitation intensity when the cyclone core passes. The existence of wave trains within the boundary surface of the air masses is probably necessary for the explanation of these results. (For a more extensive version of this article, *see item* 5.3–145, March 1954, *MAB.*) *Subject Headings:* **1. Cyclonic precipitation 2. Precipitation distribution 3. United States.**—*Author's abstract.*

6.6–179 551.515.1/2

§Simpson, R. H., **Evolution of the Kona storm, a subtropical cyclone.** *Journal of Meteorology*, 9(1):24–35, Feb. **1952.** 25 figs., 2 tables, 11 refs. **MH-BH**—Kona cyclonic storms of Nov.–March near Hawaii are discussed with surface, 300 and 500 mb charts. Two types described—occlusion of wave cyclones developing circular symmetry and deepening (Jan. 5–7, 1949), and cyclogenesis from upper cold lows (Feb. 18–21, 1951). Tracks are very erratic. Structure is discussed with composite charts, upper air soundings and typical cross sections; winds and rain increase outwards from a central calm but squall lines may occur. Subsequent development may be into a wave cyclone or tropical storm. *Subject Headings:* **1. Kona storms 2. Cyclonic storms.**—*C.E.P.B.*

6.6–180 551.515.1:551.515.3(792)

Wyett, Roy E. (*U. S. W. B., Salt Lake City, Utah*), **Pressure drop in a dust devil.** *Monthly Weather Review*, 82(1):7–8, Jan. **1954.** 2 figs. **MH-BH**—Notes on phenomena associated with passage of a strongly developed dust devil over a C.A.A. communications and weather reporting station at St. George, Utah, on Aug. 12, 1953. The 4-day microbarograph in the building (which had doors and windows on SE side open) showed a drop of 0.040 in. and an equal rise in about 3 sec. Pressure trace is reproduced and altitude of dust devil in relation to building and microbarograph shown on diagram. *Subject Headings:* **1. Dust devils 2. Microbarograph records 3. Barometric depressions in dust devils 4. St. George, Utah.**—*M.R.*

6.6–181 551.515.11(73,71)

§Allen, Philip W. and Creash, Vincent J., **Changes in the vertical mass distribution in the vicinity of the rapidly deepening low of March 24–26, 1954.** *Monthly Weather Review*, 82(3):87–95, March **1954.** 10 figs., 8 refs. **MH-BH**—A synoptic and dynamic analysis of a cyclone which moved from the southwest toward the Great Lakes and Labrador on March 24–26 and deepened rapidly in the Lakes region (whereas a similar cyclone a week earlier did not deepen), leads to the conclusion that the dynamic or the thermal approach to pressure change can be applied with equal success in explaining the cyclogenesis. Advection of warm stratosphere (above 200 mb) is indicated, rather than formation by subsidence. *Subject Headings:* **1. Cyclone dynamics 2. Deepening 3. Tropopause warming 4. United States 5. Canada.**—*M.R.*

6.6–182 551.515.11

DesJardins, Robert B. and Gleeson, Thomas A., **On the relations of size and central height to intensity in cyclones at 500 millibars.** Florida. State Univ. Dept. of Meteorology, Contract AF 19(122)-466, Scientific Report, No. 6, May 15, **1954.** table, 9 refs. **MH-BH**—The relations of size and central height to intensity of cyclones at 500 mb are investigated statistically. Simple parameters are chosen to represent size and intensity, and are evaluated for European cyclones during 1950. It is found that size and intensity have no significant correlation. Central height and intensity are poorly correlated, but the 24-hr changes of these two quantities are better related. Limitations of these results are indicated. *Subject Headings:* **1. Cyclone analysis 2. Cyclone intensities.**—*Authors' abstract.*

6.6–183 551.515.2(967)

Simpson, R. H., **Hurricanes.** *Scientific American*, 190(6):32–37, June **1954.** 3 figs., 3 photos. **DLC**—A semi-popular article on the structure of hurricanes and the history of reconnaissance flights through center of tropical cyclones. A model cross-section of a hurricane is shown. Radar observations are an important part of the reconnaissance. Details of a flight in which the author participated (Aug. 15, 1951 from Guam—typhoon "Marge") are recounted. *Subject Headings:* **1. Hurricane reconnaissance 2. Cyclone models 3. Typhoon "Marge" (1951) 4. Guam.**—*M.R.*

6.6–184 551.515.2:551.543:525.6

Smiley, Charles H., **Tidal forces and the formation of hurricanes.** *Nature*, London, 173(4400):397, Feb. 27, **1954.** 2 tables. Also: Jordan, Charles L. and Smiley, Charles H. (the same title). *Ibid.*, 175(4444):38–39, Jan. 1, **1955.** table, 5 refs. **DWB**—Data for N. Atlantic from TANNEHILL's **Hurricanes,** 1952 (*see item* 4.7–9, July 1953, *MAB*) were examined statistically for effects of solar-lunar atmospheric tides. Decrease from 40 Sept. 8–14 to 17.5 per week Sept. 23–30 is significant at 2% level. Effect is also shown by lunar 18-year cycle. By rearranging data, JORDAN throws doubt on SMILEY's hypothesis that tidal forces play a part in the formation of hurricanes. He suggests that the low hurricane frequency in Sept. 23–30 represents the transition between circulation patterns favorable to developments E of to W of 70°W. SMILEY replies that this does not affect his argument from the year-by-year count of hurricanes. *Subject Headings:* **1. Atmospheric tides 2. Hurricanes.**—*C.E.P.B.*

6.6–185 551.515.2

Takeuchi, M., **The motion of tropical cyclones in a non-uniform flow field.** *Papers in Meteorology and Geophysics*, Tokyo, 3(4):252–268, March **1953.** 9 figs., 2 tables, 21 refs.,

43 eqs. **MH-BH**—The motion of tropical cyclones in a circular or hyperbolic flow of uniform vorticity is treated theoretically. The quantitative formulation of the steering principle is undertaken. The motion will trace a trochoid in a linear flow, an epicyclic in a circular flow and a similar motion to the former two in a hyperbolic flow. The amplitude and period of oscillation depend on the wind speed of the basic current and on the size and intensity of the storm and not on the Coriolis parameter. Both speed and direction of a tropical cyclone are considerably affected by its oscillating motion. In some cases the storm will describe a loop path as a result of the oscillation. *Subject Headings:* **1. Cyclone movement 2. Tropical cyclones.**—*Author's abstract.*

6.6–186 551.515.22(265)

§*La Seur, N. E. and Jordan, Charles L., **A typical weather situation of the typhoon season.** Chicago Univ. Dept. of Meteorology, March **1952.** 24 p. 83 figs. **DWB**—A detailed general and local synoptic-aerological analysis is made of the origin, structure and movement of 3 typhoons which traversed the W. Pacific between Sept. 27 and Oct. 6, 1945 with accompanying cross sections; streamline analysis charts of the flow field at 2000, 10,000 and 40,000 ft. and sea level and 700 mb contour charts for approximately 0000 GMT each day. Time cross sections (sfc. to 60,000 ft) are presented for 19 stations (island and weather ships) located throughout the central and western Pacific. The large format of this report enables the reader to study all of the charts for *one* day on a single page with the explanatory material on general and local circulation and weather, typhoon movement, etc. on the facing page for each of the 9 days represented. The importance of the wind field in tropical analysis is emphasized. *Subject Headings:* **1. Tropical meteorology 2. Typhoon analysis 3. Synoptic aerological studies 4. Western Pacific. I. Riehl, Herbert.**—*M.R.*

6.6–187 551.515.23

§James, R. P. and Thomas, C. F. (*U. S. W. B., Wash., D. C.*), **Hurricane Barbara, 1953.** *Monthly Weather Review*, 81(8):255–265, Aug. **1953.** 20 figs., table, 3 refs. **MH-BH**—This hurricane which moved from the Bahamas on Aug. 11, 1953 to Hatteras Aug. 13 and NNE to New England on the 14th followed almost the same track as the storm of Sept. 10–16, 1933. Both were blocked near Newfoundland and moved northward in that area. Not much damage was done, except on the North Carolina coast where 90 mph gusts were recorded. Rainfall amounts up to 9.67" (Nags Head, N. C.) were recorded. Steering and extratropical cyclogenesis are the two aspects of this storm which are treated in detail in the synoptic and upper air analysis. *Subject Headings:* **1. Hurricane tracks 2. Steering of hurricanes 3. Hurricane "Barbara" (1953).**—*M.R.*

6.6–188 551.515.3:551.515.8(73/9)

*Fawbush, Ernest J. and Miller, Robert C. (*Tinker A. F. Base, Okla.*), **The types of air masses in which North American tornadoes form.** *American Meteorological Society, Bulletin*, 35(4):154–165, April **1954.** 12 figs., 4 tables, 14 refs. **MH-BH**—Examples and statistics are presented, taken from results of an analysis of 286 soundings obtained in connection with tornadoes which have occurred in several parts of the U. S. Three types of air masses in which tornadoes may form are distinguished. The usual type with moist layer at 850–500 mb and very dry air above and winds increasing with altitude is characteristic of the Great Plains tornadoes. Type II is found in the region of the Gulf of Mexico and adjacent states from Texas to Florida. No stable area or inversion occurs above the moist layer. Steep lapse rates, high humidities and decreasing winds with height are characteristics which identify the air mass. Tornadoes occur in only a few of the thunderstorms in an area, and they never last long. Type III is found in California and Oregon, and is characterized by cool moist air to great heights with steep lapse rates (conditionally unsteady) and winds increasing with height. None are severe, nor do they occur in families. *Subject Headings:* **1. Tornado air masses 2. Tornado statistics 3. Air masses 4. United States.**—*M.R.*

6.6–189 551.515.3(439.1)

§Ozorai, Zoltán, **Pusztító szélvihar Tata környékén.** [Destructive storm near Tata.] *Időjárás*, 58(3):190–192, May/June **1954.** 4 figs. **MH-BH**—The tornado (a rare phenomenon

in Hungary) which took place in western Hungary on May 7, 1954, affected a territory 5–6 km in length and 100 m in width. The synoptic situation over Europe and Hungary before and during the storm is discussed in detail and illustrated by charts. Progress of the storm and damage along its path are described. *Subject Headings:* **1. Tornadoes 2. Tata, Hungary.**—*G.T.*

6.6–190 551.515.31(78)

Reber, Carl M. (*U. S. W. B., Wash., D. C.*), **The South Platte Valley tornadoes of June 7, 1953.** *American Meteorological Society, Bulletin,* 35(5):191–197, May **1954.** 12 figs. **MH-BH**—An eye-witness account of six tornadoes observed in extreme northeastern Colorado and western Nebraska on June 7, 1953. Detailed descriptions accompanied by pencil sketches, made while the tornadoes were being observed give an account of the formation characteristics and dissipation of the tornadoes. The author believes that since the tornadoes observed formed under a forward extension of the main thunderstorm cell, the direct mechanism setting off the tornado may not be within the thunderstorm cell itself, but in extremely localized areas near the thunderstorm, and that the greatest instability exists through a limited vertical extent. The synoptic conditions associated with the tornadoes were discussed. *Subject Headings:* **1. Tornado formation 2. Synoptic conditions for tornadoes 3. South Platte Valley.**—*I.L.D.*

6.6–191 551.515.4:525.6(43)

Becken, Friedrich Wilhelm, **Widerlegte Volksmeinung: Gewitter und Gezeiten.** [Popular belief refuted: thunder and tides.] *Annalen der Meteorologie,* 6(5/6):185–187, **1953/54.** 2 tables. **MH-BH**—Author examines popular belief at Cuxhaven that thunder comes with the flood tide. In 1945–54 there was no statistical relation. *Subject Headings:* **1. Thunderstorms 2. Tides 3. Cuxhaven, Germany.**—*C.E.P.B.*

6.6–192 551.515.4:629.135(78)

Summer flying hazards. *Flying Safety,* Wash., D. C., 10(6):14–15, June **1954.** diagr., photo. **DWB**—Out of 194 Air Force plane accidents which occurred during June–Aug. 1947–1952 in which weather was a factor, about ⅓ were attributed to surface winds and ⅓ to thunderstorms. The majority (56%) occurred in the Plain States from the Rockies to the Missouri–Mississippi. Analyzing only those in which weather was the primary factor (27 of the 194) it was found that 96% (25) involved thunderstorms. The high accident rate due to thunderstorms is said to be caused by pilots' unawareness of the existence of or the dangers attending thunderstorms in the Plains region. Only 9% of the 194 accidents occurred west of the Rockies. Half of the "rain" accidents occurred east of the Appalachians. *Subject Headings:* **1. Aircraft accidents 2. Thunderstorm hazard to aircraft 3. Wind hazard to aircraft 4. Great Plains, United States.**—*M.R.*

6.6–193 551.515.8:37

Pope, J., **Frontal model.** *Weather,* 9(1):20–21, Jan. **1954.** 3 figs. **MH-BH**—Description of a movable perspex model which can be used with a daily weather chart to illustrate frontal types and development. *Subject Headings:* **1. Frontal model 2. Teaching of meteorology.**—*C.E.P.B.*

RADIATION AND TEMPERATURE

RADIATION

See also: **Astronautica Acta,** 6.6–7; **Atmos. transmission** (Pearson), 6.6–76; **Infrared spectroscopy** (Randall), 6.6–77; **Weather forecasting . . .** (Abbot), 6.6–117; **Night cooling . . .** (Roberts), 6.6–122; **Climatic fluctuation & solar cycle** (Wexler), 6.6–303; **Causes of ice ages** (Menzel), 6.6–309; **Climatic change** (Wollbach), 6.6–310.

6.6–194 551.521.1:612.5:595.78

Vielmetter, Walter, **Die Temperaturregulation des Kaisermantels in der Sonnenstrahlung.** [Temperature regulation of the mother-of-pearl butterfly in solar radiation.] *Naturwissen-*

schaften, 41(22):535–536, Nov. 1954. 3 refs. **DWB**—Some strongly pigmented fliers use the sun as a heat regulator by changing the angle of their surfaces to the sun. Experiments with a butterfly showed that body surface temperature could be changed in this way by up to 17°C to maintain a temperature of 34°C. The regulation is governed by direction of light rays, not heat radiation. *Subject Headings:* **1. Solar radiation effects 2. Body temperature 3. Butterflies.**—*C.E.P.B.*

6.6–195 551.521.14:551.521.31

Blackwell, M. J.; Eldridge, R. H. and Robinson, G. D., **Estimation of the reflection and absorption of solar radiation by a cloudless atmosphere from recordings at the ground, with results for Kew Observatory.** *Great Britain. Meteorological Research Committee, M.R.P.* 894, Dec. 7, 1954. 19 p. 12 figs., 9 tables, 19 refs. Mimeo. **DWB**—Records on cloudless occasions at Kew in 1947–51 of total, direct and diffuse radiation (total and two spectral regions) and illumination on a horizontal surface are discussed, including effect of London smoke with E. winds. Attenuation of radiation by Rayleigh scattering and "Fowle" (particulate) scattering and by water absorption, and diffuse radiation, are computed by several methods for a model atmosphere. Results are compared with those given by the extra-terrestrial distribution of solar radiation proposed by NICOLET and known attenuation of an unpolluted atmosphere. The results are consistent if the measured illumination is reduced by 5%. Absorption is estimated as rather less than 10% with another 10% for "grey" multiple scattering. Albedo of cloudless atmosphere (total and various wave lengths) is plotted against sine of solar altitude. *Subject Heading:* **1. Albedo of atmosphere.**—*C.E.P.B.*

6.6–196 551.521.3

Takeo, Makoto and Ch'en, Shang-Yi (*Physics Dept., Oregon Univ.*), **Theory of fine structure pressure broadening of spectral lines.** *Physical Review*, 93(3):420–424, Feb. 1, 1954. foot-refs., eqs. **DWB**—The difference of pressure broadenings and shifts of the doublet components of the principal series lines of alkalis is treated in an approximate manner. Applying the perturbation method and the Franck-Condon principle to the Michels, deBoer, and Bijl model of compressed atoms in the doublet P states, it is shown that the doublet separation becomes smaller with increasing pressure at rather low pressure. Consequently, the shift of the $^2P_{\frac{1}{2}}$ must be smaller than that of the $^2P_{\frac{3}{2}}$ component of the principal series. The attractive forces are recalculated with the inclusion of the quadrupole moment for the $^2P_{\frac{1}{2}}$ state. This consideration requires splitting of the state according to the magnetic quantum numbers so that the $^2P_{\frac{1}{2}}$ component will be 1.12 times larger in half-width than $^2P_{\frac{3}{2}}$ in the approximation of the collision theory. This result is in good agreement with experimental values. *Subject Headings:* **1. Pressure broadening of spectral lines 2. Perturbation method.**—*Authors' abstract.*

6.6–197 551.521.32

Horak, Henry G. and Lundquist, Charles A. (*Kansas Univ.*), **The transfer of radiation by an emitting atmosphere, Pt. 2.** *Astrophysical Journal*, Chicago, 119(1):42–50, Jan. 1954. 2 figs., tables, 7 refs., 64 eqs. **DLC, DWB**—The transfer of radiation by a plane-parallel atmosphere containing a linear distribution of emission sources is considered for the isotropic case. The exact expressions for the emergent intensity are derived from both finite and semi-infinite atmospheres. It is shown how the exact field at any depth can be obtained. (For Pt. 1 *see item* 4.11–147, Nov. 1953, *MAB.*) *Subject Heading:* **1. Atmospheric heat emission.** —*Authors' abstract.*

6.6–198 551.521.32

Yamamoto, Gi-ichi (*Geophysical Inst., Tohoku Univ.*), **Radiative equilibrium of the earth's atmosphere, Pt. 1; The grey case.** *Tohoku Univ., Science Reports, 5th Ser., Geophysics*, 5(2):45–57, Oct. 1953. 5 figs., 6 tables, 9 refs. **MH-BH**—In the present paper the fourth approximate solution of the equation of radiative equilibrium of the grey case with finite optical thickness was obtained with use of the method of discrete ordinate extended by CHANDRASEKHAR. One of the characteristics of the solution is that the smaller the total optical thickness of the absorbing medium the higher its equilibrium temperature at the top of the

medium. With application of the solution to the earth's atmosphere whose absorbing medium was assumed to be water vapor with grey absorption coefficient, some characteristics of the stratosphere, i.e., the decrease of the tropopause height and the increase of the tropopause temperature with increasing latitude, are explained by the decrease of water vapor content in the atmosphere with increasing latitude. *Subject Heading:* **1. Radiative equilibrium.**—*Author's abstract.*

6.6–199 551.521.4:551.593.55

Ashburn, Edward V. (*Michelson Lab., U. S. Naval Ordinance Test Station, Inyokern, Calif.*), **Brightness and color of the twilight sky.** *Optical Society of America, Journal*, 43(9): 805–806, Sept. **1953.** 11 refs. **DWB**—Comments on HULBURT's paper (*see item* 5.1–158, Jan. 1954, *MAB.*) *Subject Headings:* **1. Twilight sky brightness 2. Zenith twilight. I. Hulburt, E. O.**—*M.R.*

6.6–200 551.521.4

Wark, David Q. and Stone, John M., **Measurement of the Doppler width of the λ 5577 line in the night sky.** *Nature*, London, 175(4449):254–255, Feb. 5, **1955.** 2 figs., 4 refs. **DWB**—Apparatus and procedure are described with an example of a photographic record. Temperature of the emitting layer is estimated as between 231 and 155°K (at about 100 km). *Subject Heading:* **1. Night sky spectra.**—*C.E.P.B.*

6.6–201 551.521.6

Pierce, A. Keith, **Relative solar energy distribution in the spectral region 10,000–25,000 A.** *Astrophysical Journal*, 119(2):312–327, March **1954.** 8 figs., 2 tables, 18 refs., 8 eqs. **DLC**—Tables are given of the observed relative solar energy distribution for zero air mass in the wave-length interval 10,000–25,000 A. The observations are based on measures made at Mount Wilson at the Snow telescope with high resolution—band pass 0.30 A. The calibration of the spectral response of the equipment was evaluated by observations of a black-body source and a pyrometric arc. A detailed description of the comparison sources and their use is given. *Subject Headings:* **1. Solar spectra 2. Spectral radiation distribution.**—*Author's abstract.*

6.6–202 551.521.61:681.177

Blanton, Elaine H. and Frawley, Joanna, **Spectroscopy from the point of view of communication theory, Pt. 4, Automatic recording of infrared spectra on punched cards.** *Optical Society of America, Journal*, 44(5):397–402, May **1954.** 4 figs., 4 refs. **DLC**—It is desirable to record infrared spectra point by point in digital form on punched cards in order to use automatic-machine methods of processing the data; for example, in calibration, conversion to absorption coefficient, comparison of spectra, subtraction of spectra of an identified constituent from that of an unknown mixture. Recording spectra in this way also allows the introduction of new methods suggested by communication theory of improving signal-to-noise ratio by smoothing noisy data with correlation functions. In applying these methods the computing machine can be considered as a nonlinear filter, part of the infrared equipment. The punched-card record is made by attaching to the output of the detector voltage amplifier a Digital Reader in parallel with the conventional graphic recorder. The Digital Reader converts the deflection voltage into a binary code represented by closure of circuits. These may be made to operate a Key Punch which punches into a single column of a standard card the record of the voltage in binary digital form. The data can then be processed by standard punched-card equipment. Examples of various kinds of spectra recorded in digital form on punched cards are presented, together with some examples of processed data. *Subject Headings:* **1. Infrared spectra 2. Punched card computations.**—*Authors' abstract.*

6.6–203 551.521.61

*Linke, Franz and Möller, Fritz, **Langwellige Strahlungsströme in der Atmosphäre und die Strahlungsbilanz.** [Long wave radiation in the atmosphere and the radiation balance.] *Handbuch der Geophysik*, Berlin, 8:651–721, **1942.** figs., tables, foot-refs., eqs. **DWB**—The measurement of effective radiation (outgoing) during the day and at night is considered in all of its aspects. Results of measurements and calculations are summarized, giving variations

with latitude, season, height, cloud cover, effect of inversions, haze boundaries absorption by water vapor, CO_2, O_3, turbidity, etc. in various wave lengths. Counter radiation, radiation coefficients, charts for calculation (ELSASSER, MÖLLER, etc.), theory of monochromatic radiation in the atmosphere, pressure and temperature dependence of absorption coefficients, line absorption and, finally, the actual radiative balance of the atmosphere are reviewed in detail. *Subject Headings:* **1. Infrared radiation 2. Radiation balance 3. Pressure and temperature dependence of absorption.**—*M.R.*

6.6–204 551.521.63:551.46

Le Grand, Yves; Lenoble, Jacqueline and Saint-Guily, Bernard, **Étude de la pénétration de l'ultraviolet dans la mer.** [Investigation of the penetration of ultraviolet light into the sea.] *Annales de Géophysique*, 10(1):59–63, Jan./March **1954.** 8 figs., 7 refs. **MH-BH**—A spectrograph is described in detail and illustrated by several diagrams. First trial measurements made with the apparatus at the Oceanographical Museum of Monaco yielded satisfactory underwater records down to 50 m below the sea surface. A sample film strip is presented. Curves representing results of the preliminary measurements (4100–3200 Å) are given; they show: a) variation of the vertical energy flux as a function of depth, b) spectral variation of the decimal absorption coefficient of the sea and c) spectral variation of the relation of horizontal and upward flux to the downward flux. *Subject Headings:* **1. Ultraviolet light penetration into the sea 2. Spectrographs.**—*G.T.*

6.6–205 551.521.63

Lenoble, Jacqueline, **Contribution à l'étude du rayonnement ultraviolet solaire, de sa diffusion dans l'atmosphere et de sa pénétration dans la mer.** (I). [Contribution to the investigation of ultraviolet solar radiation, its atmospheric diffusion and its penetration into the sea. (I)] *Annales de Géophysique*, 10(2):117–147, April/June **1954.** 13 figs., 9 tables, 29 refs., 17 eqs. English summary p. 117. **DWB**—In the first part of this paper it is shown that the atmospheric radiation coming from the entire sky, due to diffusion of solar radiation by molecules of pure air, can be expressed by theoretical equations easy to obtain. The various methods of solution which have been put forward, and the simplifying assumptions concerning the atmosphere are thoroughly discussed. Ultraviolet luminance of the sky in various directions is computed by an approximate iteration method. The case of an homogeneous cloud layer is briefly considered. *Subject Heading:* **1. Ultraviolet radiation.**—*Author's abstract.*

6.6–206 551.521.63:551.510.42

Miyake, Y.; Saruhashi, K. and Sakurai, S., **The decrease of the ultraviolet solar radiation by city smog occurring in winter.** *Papers in Meteorology and Geophysics*, Tokyo, 3(3):224–225, Jan. **1953.** 3 figs., 2 refs. **MH-BH**—Values of ultraviolet solar radiation (obtained with Miyake's UV actinometer) and of total radiation (measured with Robitzsch's pyrheliometer) for Tokyo are graphically compared with those for the suburbs of Tokyo. The measurements were made during the winter 1950–51. It is found (among other facts) that city smog has a considerably stronger effect upon ultraviolet radiation than upon total radiation, especially in the morning and late afternoon. *Subject Headings:* **1. Ultraviolet radiation 2. Smog 3. Tokyo, Japan.**—*G.T.*

6.6–207 551.521.64:92

B—, D. M., **Obituary: Robert A. Millikan (1868–1953).** *Science and Culture*, Calcutta, 19(12):598–600, June **1954.** port. **DWB**—The scientific work of MILLIKAN ("after MICHELSON, the outstanding experimental physicist of his generation in the U.S.A.") is briefly reviewed. Particular attention is paid to his systematic investigation of cosmic ray intensity as a function of altitude and latitude conducted in India in 1938, and his cosmic ray theory derived therefrom. *Subject Headings:* **1. Obituaries 2. Cosmic radiation 3. Millikan, Robert A.**—*G.T.*

6.6–208 551.521.64

Farley, F. J. M. and Storey, J. R., **The sidereal correlation of extensive air showers.** *Physical Society of London, Proceedings, Ser. A*, 67(11):996–1004, Nov. 1, **1954.** 5 figs.,

table, 14 refs. **DWB**—About 3×10^5 extensive air-shower events were recorded at Auckland (altitude 40 m, latitude 37°S) with 3 counter trays at the corners of a 4 m triangle, each of sensitive area 2360 cm², in the period Feb. 1951 to Feb. 1952. The results show a solar diurnal amplitude of $(1.45\pm0.25)\%$ with maximum at (2.7 ± 0.6) hours local solar time and a sidereal diurnal amplitude of $(1.10\pm0.26)\%$ with maximum at (19.8 ± 0.9) hours local sidereal time (standard errors). By introducing the concept of antisidereal time (there are 364.2 antisidereal days per year) an allowance is made for the seasonal amplitude modulation of the solar diurnal variation. When this correction is applied, the true sidereal diurnal amplitude becomes $(1.43\pm0.38)\%$ with maximum at (17.6 ± 1.0) hours local sidereal time. The results indicate a maximum in the cosmic ray intensity when the galactic plane is overhead. *Subject Headings:* **1. Cosmic ray showers 2. Auckland, New Zealand.**—*Author's abstract.*

6.6-209 551.521.64:539

Hodgson, P. E., **Elementary particles.** *Science Progress*, 42(168):599–607, Oct. **1954. DWB**—The experimental and theoretical difficulties in the study of fundamental particles in cosmic radiation, cloud chambers and photographic emulsion are outlined. Though the term "elementary particles" is retained, strictly they are neither elementary nor particles. Terminology and definitions are set out, with notes on mass, energy, mean life, decay scheme and interrelations. Useful for reference. *Subject Headings:* **1. Corpuscular radiation 2. Subatomic physics.**—*C.E.P.B.*

6.6–210 551.521.7:551.594.6

Minkowski, Rudolph and Greenstein, Jesse L. (*Mt. Wilson and Palomar Observatories, Carnegie Inst. of Wash., Calif. Inst. of Techn.*), **The power radiated by some discrete sources of radio noise.** *Astrophysical Journal*, Chicago, 119(1):238–242, Jan. **1954.** table, 6 foot-refs., 7 eqs. **DLC, DWB**—The identification by Baade and Minkowski of some of the strongest sources of radio noise permits us to estimate the energy emitted per unit volume. These strongest discrete sources radiate at a rate higher by many orders of magnitude than our Galaxy. Collisions of gas masses may provide sufficient energy. *Subject Headings:* **1. Radio noise 2. Galactic radio frequency radiation.**—*Authors' abstract.*

6.6–211 551.594.11:551.521.64

Piccardi, Giorgio, **Relazioni fra fenomeni chimico-fisici e fattori geofisici.** [Relation between chemico-physical phenomena and geophysical factors.] *Geofisica e Meteorologia*, Genoa, 1(6):103–106, Nov./Dec. **1953.** 3 figs., 4 refs. **MH-BH**—Curves obtained in 1951–53 at Florence show effect of atmospheric potential gradient pressure, and solar activity on precipitation of BiOCl in a tank shielded by various thicknesses of lead. Diurnal and seasonal as well as irregular variations are discussed. Cosmic radiation is possible factor, even though atmospheric phenomena (fronts, pressure, rainfall, etc.) are also correlated, since these factors may affect cosmic radiation and indirectly the ionization in the enclosed space. *Subject Headings:* **1. Physico-chemical effects of weather 2. Cosmic ray effects.**—*M.R.*

6.6–212 551.521.64:537.591.2

Waddington, C. J., **The alpha-particle component of the cosmic radiation.** *Philosophical Magazine*, Ser. 7, 45(371):1312–1321, Dec. **1954.** 2 figs., 13 refs. **DWB**—To investigate primary α-particle component a stack of emulsions was flown for 4 hours at 98,000 ft in geomagn. lat. 55°N. The mean free path in emulsion was 60 ± 17 g/cm². The primary flux was 320 ±36 α-particles/m²/steradian/sec. The energy spectra of these particles is plotted. *Subject Heading:* **1. Cosmic ray intensity.**—*C.E.P.B.*

6.6–213 551.521.7

Carpenter, R. O'B., **Solar X-radiation.** Bairds Associates, Inc., Contract W19-122ac-23, Final Technical Report, No. 1, May 15, 1948 to June 30, **1951.** 97 p. figs., tables. **DWB**—An elaborate summary of the work done during 3 years of investigation of methods for measuring the soft X-radiations from the sun. Theory of sun's corona radiation and transmission through the atmosphere and through various filter materials, techniques of photography and shielding of visible radiation (>3000 Å) by thin beryllium and aluminum metal foils, problem

of evaporating and the "Pinhole Problem," design and manufacture of film packets for use in V-rocket ascents, design of shutters, analysis of data obtained on rocket ascents, causes of failure, actual data and unfinished work are discussed and amply illustrated. Ten V-2 flights were attempted, involving exposure of 82 packets, 25 of which were recovered and only 3 satisfactory exposures obtained during the period from Dec. 1947–March 1951. It is concluded that foil filters are not satisfactory for determining distribution of solar energy at specific wave lengths in the X-ray bands. Crystal grating spectrometers are suggested as more practicable. A scintillation counter appears to be more satisfactory than a photographic film, and the NRL has experimented with Geiger counters for measuring solar X-rays. Need is for a crystal spectrometer. Only two laboratories to study X-rays are in operation in the U. S. (at Ohio State and at Washington State). Maximum expected intensity of X-radiation is at 29 Å. Percentage and actual transmission of radiation below this, and below 15, 10 and 5 Å is tabulated. Transmission of *Be, Al,* and *Cr* 2μ thick, and of *Al* foil of various thicknesses shown on graph for 0–30 Å. Transmission tests were made at Univ. of Oregon. Relative absorption for $\lambda = 1$–10 Å and 10–100 miles height given. *Subject Headings:* **1. Solar X-radiation 2. X-ray photography 3. V-2 rockets.**—*M.R.*

6.6–214 551.521.7:621.396.8:550.385

Denisse, Jean-François, **Relation entre l'activité géomagnétique et l'activité radioélectrique solaire.** [Relation between geomagnetic activity and radioelectric solar activity.] *Annales de Géophysique,* 8(1):55–64, Jan./March **1952.** 3 figs., 13 refs. English summary p. 55. **DWB**—Following daily measurements of solar radiation on 158 Mc/s, made at Marcoussis from 1948 to 1950, the effect of solar active centers on radioelectric and geomagnetic intensity is analyzed. Among solar energy centers discrimination is made between radioelectrically active and inactive centers. The former are found to be followed 2–3 days after their passage through the central solar meridian by increased geomagnetic activity, while the latter have no geomagnetic effect. *Subject Headings:* **1. Solar radioelectric storms 2. Magnetic storms.**—*G.T.*

6.6–215 551.521.7:523.75

Dobson, Helen W.; Hederman, E. Ruth (*McMath-Hulbert Observ., Michigan Univ.*) and Covington, A. E. (*Natl. Res. Council, Canada*), **Solar flares and associated 2800 Mc/sec (10.7 cm) radiation.** *Astrophysical Journal,* 119(3):541–563, May **1954.** 13 figs., 5 tables. **DWB**—Study of 2800 Mc/sec solar radiation at the time of 213 flares and 173 subflares has shown distinctive radio events associated with 57 per cent of the flares and 19 per cent of the subflares. The flare-associated distinctive events at 2800 Mc/sec can be described by essentially the same types and categories already used to report outstanding disturbances at this radio frequency: single bursts; single-simple bursts with and without a postburst increase; single-complex bursts with and without a postburst increase; gradual rises and falls of flux. In addition, there is the designation "null" or no distinctive event. There is strong evidence that there is an outstanding event or disturbance in 2800 Mc/sec radiation. One is a sudden burst-type feature which occurs during the rise to maximum of the $H\alpha$ flare. The other is the more gradual rise and fall of flux and "postburst increase," which lasts as long as, or longer than, the flare itself. Both types of phenomena appear to start with the $H\alpha$ flare. Flares associated with large "postburst increases" or "gradual rises and falls" show a high concentration toward the central part of the solar disk. This is not the cause for the strictly "burst-type" disturbances. The importance of the flare, the position of the flare on the solar disk, and accompanying ionospheric disturbances are considered with respect to the form and energy excess of the associated events at 2800 Mc/sec. *Subject Headings:* **1. Solar flares 2. Radio noise bursts.**—*Authors' abstract.*

6.6–216 551.521.7:550.385

Smyth, M. J., **Photoelectric investigations of solar corpuscular radiation I.** *Royal Astronomical Society, Monthly Notices,* 114(2):137–153, **1954.** 7 figs., 3 tables, 24 refs. **DWB**—The hypothesis that magnetic storms are caused by clouds of solar particles emitted during flares is tested by photoelectric observations designed to detect anomalous absorption in the violet wing of the solar K line following flares. The Cambridge spectrophotometer is described. Observations following flares are set out. In no case was any absorption reaching 0.5%

(doubtfully 1%) found even when flares were followed by magnetic disturbance. *Subject Headings:* **1. Corpuscular radiation 2. Magnetic storms.**—*C.E.P.B.*

6.6–217 551.521.9:621.396

Bolton, J. G.; Westfold, K. C.; Stanley, G. J. and Slee, O. B., **Galactic radiation at radio frequencies, Pt. 7, Discrete sources with large angular widths.** Also: Bolton, J. G.; Stanley, G. J. and Slee, O. B., . . . , **Pt. 8, Discrete sources at 100 Mc/s between declinations +50° and −50°.** *Australian Journal of Physics*, Melbourne, 7(1):96–129, March **1954.** 13 figs., 4 tables, 22 refs. **MH-BH**—In Pt. 7 observations with three forms of equipment have revealed the existence of a number of sources of angular width more than 1°. A rough analysis of the brightness distribution of one source shows that it is elongated along a parallel of galactic latitude. This source appears to be typical of a class that is generally distributed around the galactic equator, and may represent fine structure in the distribution of radiation from the Galaxy. Of the others, one appears to be associated with the abnormal galaxy NGC 5128, and another has been identified with a network of gaseous filaments in our own Galaxy. In Pt. 8 one hundred and four discrete sources have been found from a survey covering declinations +50 to −50°. The individual sources are compared in position and flux density with those of previous surveys. The observed distribution shows the concentration of sources of all brightnesses to the galactic equator found by Brown and Hazard (1953) and the concentration of the bright sources to the equator found by Mills (1952*a*, 1952*b*, 1952*c*). A new concentration of faint sources is evident in the southern galactic hemisphere. There is strong evidence for departures from a homogeneous isotropic distribution for the sources outside a 20° zone about the galactic equator. Ten identifications between sources and visible objects are suggested; seven of these are between faint sources and extragalactic nebulae of photographic magnitude about 12.5, and three with galactic nebulosities. One of the latter is the expanding shell of Nova Aquila 1918. *Subject Heading:* **1. Galactic radio frequency radiation.**—*Authors' abstract.*

6.6–218 523.32:551.521.9:536.21

Jaeger, J. C. (*Australian National Univ., Canberra*), **Conduction of heat in a solid with periodic boundary conditions, with an application to the surface temperature of the moon.** *Cambridge Philosophical Society, Proceedings, Pt.* 2, 49:355–359, April **1953.** fig., table, 5 refs., 11 eqs. **DLC**—A numerical method is developed for the solution of the heat conduction problem assuming that the surface temperature is a periodic step function. Twenty intervals give sufficient accuracy. Applying the theory to the temperature of the moon at the equator during a lunation, the author concluded that the moon must be covered by fine dust. Furthermore, it is shown how to compute the effective temperature of the lunar surface for observations by radio microwaves. *Subject Headings:* **1. Lunar temperatures 2. Heat conductivity.**—*A.A.*

6.6–219 551.521.9:551.593.55:535.33

Pillow, M. E., **Intensities in band systems of O_2: $^3\Sigma_{u+}-{}^1\Sigma_{g+}$ (Broida-Gaydon system) and $^1\Sigma_{g+}-{}^3\Sigma_{g-}$ (Atmospheric system).** *Royal Society of London, Proceedings, Ser. A*, 67(9): 847–849, Sept. 1, **1954.** 3 tables, 5 refs. **DWB**—Most of the bands in oxygen afterglow fitted into the Herzberg bands of O_2. Nearly all the others can be accounted for by the Broida-Gaydon system transition. *Subject Headings:* **1. Afterglow 2. Broida-Gaydon system.** —*C.E.P.B.*

TEMPERATURE

See also: **Upper air temp. & humidity** (Emon), 6.6–13; **Influence of earth's surface on atmos.** (Businger), 6.6–14; **Night cooling . . .** (Roberts), 6.6–122; **Temp. of stratosphere** (Elterman), 6.6–159; **Singularities in annual variations of grass, air & soil temp.** (Lawrence), 6.6–301.

6.6–220 551.524:551.571:612

Kerslake, D. McK., **Factors concerned in the regulation of sweat production in man.** *Great Britain. Flying Personnel Research Committee, F.P.R.C.* 879, **1954.** 23 p. 5 figs., table, 25 refs. Mimeo. **GB-MO**—Much work on physiology of sweating is discussed, leading to the hypothesis that the sweat rate depends on the temperature of receptor nerve endings

at some depth in the skin, which in turn depends on skin temperature and heat flow through the skin. A number of experiments to test this are analyzed and it is concluded that the results "may be satisfactorily explained on the assumption that sweat rate is determined by the temperature of hypothetical end organs situated at about the level of the superficial arterial plexus in the dermis." *Subject Headings:* **1. Temperature effects 2. Humidity effects 3. Sweating.**—*C.E.P.B.*

6.6–221 551.524.1(42)

Richardson, W. E., **Temperature differences in the South Tyne Valley, near Alston, Cumberland.** *Weather*, 9(3):82–85, March **1954.** 3 figs. **MH-BH**—Thermograph records at three stations in the narrow South Tyne Valley (running S–N) are discussed. On some nights differences up to 14.5°F in the minima were recorded. *Subject Headings:* **1. Temperature microvariations 2. Northumberland, England.**—*C.E.P.B.*

6.6–222 551.524.2(52)

*Ozawa, Y. and Tsuboi, Y. (*Natl. Inst. of Agric. Sciences, Tokyo*), **On the distribution of air temperature in winter at Aoki-village.** *Journal of Agricultural Meteorology*, Tokyo, 7(3/4):131–133, Nov. **1952.** 4 figs. In Japanese; English summary p. 133. **MH-BH**—Observations were made on minimum and maximum temperature of 38 observation-points at Aoki Village, Nagano Prefecture. The results obtained are as follows. 1) The minimum temperature is higher in elevated places than it is in low places. 2) The maximum temperature is influenced by inclination, duration, etc. 3) Thermograph records show that courses of diurnal change of air temperature vary at different places. *Subject Headings:* **1. Temperature distribution 2. Maximum temperatures 3. Minimum temperatures 4. Aoki Village, Japan.**—*Authors' abstract.*

6.6–223 551.524.3(421)

Gold, E. and Marshall, W. A. L., **Monthly temperature characteristics at Kew Observatory.** *Meteorological Magazine*, London, 83(986):245–247, Aug. **1954.** table. **DWB**—Referring to article by MARSHALL (*see item* 5.8–140, Aug. 1954, *MAB*), GOLD tabulates temperature characteristics of different months. Oct. is most often average, April–July and Nov.–Dec. changeable. MARSHALL discusses GOLD's results. *Subject Headings:* **1. Temperature variations 2. London, England.**—*C.E.P.B.*

6.6–224 551.524.3:63(777)

*Iowa. State College of Agriculture and Mechanic Arts, Ames, **Temperature duration relationships for selected Iowa meteorological stations.** Contract Cwb-8127, Report . . . March 29, **1950.** 145 p. 3 tables (p. 45–145), 18 figs., 11 refs. Typescript. **DWB**—Corrected thermograph record for an 8 week period in June and July over ten-year intervals from the meteorological stations in Iowa, having approximately the same mean temperatures, were used to tabulate temperature duration and to find temperature distributions from which specific probabilities could be obtained. On the basis of three classifications of sky cover the tabulated durations were combined (1) in the 2° intervals for a four week period for all clear, partly cloudy and cloudy days, respectively, and (2) for each 4-week period over all years for each station for days where means did not differ by more than 4°. Grouping according to similar means eliminated much of the irregularity in the histograms and both the clear and partly cloudy distributions were bimodal. Subdivision of the bimodal distribution into day and night components showed that the former were negatively skewed and the latter were positively skewed; and tests of normality indicate a skewness beyond the 5% probability level. Attempts were made to fit PEARSON's frequency curves and a curve using the method of CHARLIER to the histogram data and also computations were made using the method of COURT. In all cases the curves give a value of chi-square beyond the 5% probability level although in most instances they appeared to give a good fit graphically. The appendix contains tables giving temperature durations in hours for the period May 31–June 27 for the interval 1939–1948 for clear days at Ames, Iowa, and the moments used in studying distributions and fitting curves to temperature durations. *Subject Headings:* **1. Temperature variations 2. Temperature duration 3. Agricultural climatology 4. Iowa.**—*I.L.D.*

6.6–225 551.524.3:551.542

Nagao, T., **Interdiurnal variability of temperature in Japan and her neighbourhood, Pt. 4.** *Journal of Meteorological Research*, Tokyo, 4(6):325–331, Sept. **1952.** 5 figs. In Japanese; English summary p. (21). **MH-BH**—The distribution of interdiurnal variability of temperature in Japan and her neighbourhood is investigated by means of temperature and pressure charts and diagrams. It appears that throughout all seasons (1) interdiurnal variability is large in frontal zones and low pressure areas, (2) when the central pressure of a depression deepens, the interdiurnal variability near the center decreases, (3) when the central pressure of a strong anticyclone fills, the interdiurnal variability at the center increases. *Subject Headings:* **1. Interdiurnal temperature variations 2. Pressure-temperature correlations 3. Japan.**—*Author's abstract.*

6.6–226 551.524.3:525.3

Sugawa, T. and Kumagai, I., **On the relation between the variation of latitude and the air temperature at Mizusawa, Pt. 1.** *Journal of Meteorological Research*, Tokyo, 4(7):416–419, Oct. **1952.** 6 figs., 3 refs. In Japanese; English summary p. (27). **MH-BH**—The close connection between temperature anomalies and the corresponding momentaneous situation of the pole is applied to long-range forecasting. Momentaneous points of the pole every 0.1 year are plotted for the period 1900–1950 and extrapolated up to 1952 according to forecasting formulas developed by H. KIMURA and T. HATTORI. An analysis of the pole diagram and of temperature anomalies at Mizusawa during June, July and Aug. shows that all anomalies of monthly mean temperature can be accounted for by polar displacements. A forecast is prepared for the deviation from normal mean temperature in June, July and Aug. 1951, and Dec., Jan. and Feb. 1951–1952. *Subject Headings:* **1. Temperature variations 2. Polar displacement 3. Seasonal forecasting.**—*Authors' abstract.*

6.6–227 551.524.31(716)

*Dexter, Reid V., **Some local temperature variations in Halifax, May to September, 1953.** *Canada. Meteorological Div., Cir.* 2473, TEC-184, April 23, **1954.** 11 p. 5 figs., 7 tables. Mimeo. loose leaf. **DWB**—Daily maximum temperatures recorded in the northwest part of the city are compared with the official maxima recorded in downtown Halifax, on the east side of the city. The two sets of maxima are examined to determine whether sunshine amounts and wind velocities control the differences between them. In addition, four trips were made around the city to record nearly-simultaneous spatial temperature changes under certain conditions of wind and sunshine. The results are shown in tabular and chart form. *Subject Headings:* **1. Diurnal temperature variations 2. Temperature comparisons 3. Urban temperatures 4. Halifax, Nova Scotia.**—*Author's abstract.*

6.6–228 551.524.32

§Brooks, C. E. P., **The January thaw in New England, the January frost in Britain.** *American Meteorological Society, Bulletin*, 34(5):224–225, May **1953.** 4 figs. **DWB**—The temperature changes in Jan. in Europe, the first singularity of the year, are described with the aid of synoptic charts. In view of the difficulties inherent in statistical tests for the reality of singularities the author proposes a synoptic approach which is illustrated by a hypothetical example. This note was occasioned by EBERHARD W. WAHL's **The January thaw** in *A.M.S. Bull.*, 33(9):380 386, Nov. 1952. (For abstract *see item* 4.7–106, July 1953, *MAB.*) *Subject Headings:* **1. Temperature singularities 2. January thaw 3. New England 4. Great Britain.** —*I.L.D.*

6.6–229 551.524.34

*Pramanik, S. K. and Jagannathan, P. (*Met. Office, Poona*), **Climatic changes in India, Pt. 2, Temperature.** *Indian Journal of Meteorology and Geophysics*, 5(1):29–47, Jan. **1954.** 4 figs., 6 tables, refs. **MH-BH**—In this elaborate statistical study of trends in temperature at 30 selected and representative stations in the subcontinent of India and Pakistan, the records of mean maximum and minimum temperature for 60 to 75 years have been treated by determining the variability and by fitting orthogonal polynomials up to the 5th degree to determine if there are any long term trends in the series. Data are given *in-extenso* for each of the 30

stations, and a graphical as well as verbal analysis presented, showing the actual year to year variation as well as the 10 year moving averages (1875–1950) in the maximum and minimum, respectively. Isolines of trend for maximum and minimum, on a chart, show some regional pattern but no significant over-all trend. (For Pt. 1, *see item* 6.1–274, Jan. 1955, *MAB.*) *Subject Headings:* **1. Temperature trends 2. Statistical studies 3. India 4. Pakistan.**—*M.R.*

6.6–230 551.524.35

Eichmeier, A. H. (*U. S. W. B., Michigan*), **Is our climate changing.** *Michigan Farmer*, East Lansing, 221(12):5, 26, June 19, **1954.** photo, diagrs. **DWB**—Statistics on summer and winter temperatures in the Great Lakes States show that from 1930 to 1950 winters have been warmer much more often than colder than normal. Precipitation has been lower than normal in SW Michigan in 1953, and above normal on the upper Peninsula. The extent of the drought in the Lake States is indicated by various statistics. Conclusion is that no serious changes in climate have occurred or are occurring in this region. *Subject Headings:* **1. Mild winters 2. Climatic variations 3. Drought 4. Michigan 5. Great Lakes States.**—*M.R.*

6.6–231 551.524.35:523.74

Fischer, Rudolf, **Abnorme Jahreszeiten und Sonnenfleckenextreme.** [Abnormal seasons and sunspot extremes.] *Meteorologische Rundschau*, 7(11/12):222–223, Nov./Dec. **1954.** 3 tables. **MH-BH**—Severe and mild winters, cool and hot summers and warm springs at Leipzig and Frankfurt since 1921 are listed according to their position in the sunspot cycle. The known relation between severe winters and sunspot extremes is confirmed. *Subject Headings:* **1. Temperature anomalies 2. Sunspot effects 3. Frankfurt a.M., Germany 4. Leipzig, Germany.**—*C.E.P.B.*

6.6–232 551.524.35:551.524.37

Krick, Irving P. et al., **Plant early and gamble with frost.** *Farm Journal*, Philadelphia, 78(3):98–101, March **1954.** charts. **DWB**—Nine graphs are presented to enable a farmer living near any one of the nine cities in the U. S. (or 55 nearby places which are tied in to the 9 major cities by + or − correction factors) to determine roughly what the probability of frost would be after any given date in March–April, May or June. It is emphasized that these charts are not forecasts but represent the odds (50:50, 4:1 or 1:10) that crops planted after a given date would be subject to killing frost and are based on long records, many going back 80 years. *Subject Headings:* **1. Frost probability charts 2. Frost free season charts 3. United States.**—*M.R.*

6.6–233 551.524.36(786)

McKinney, Wilbur F. (*U. S. W. B., Helena, Montana*) and Harmantas, Christos (*U. S. W. B., Wash., D. C.*), **Record low temperatures.** *Weatherwise*, 7(2):26–45, April **1954. MH-BH**—A record (for U.S.A.) minimum temperature of −68°F was observed on Jan. 20, 1954 at Roger's Pass, Mont. The reading was below the bottom mark on the thermometer scale, but the observer noted exact position of top of scale relative to bore of thermometer. The instrument was subsequently checked by the U.S.W.B. Instrument Div. in Washington, and a correction of −1.7° seems reasonably reliable, making a temperature of −69.7°F the probable value. Roger's Pass is located at 5470 feet ½ mile from summit of Continental Divide. *Subject Headings:* **1. Extreme temperatures 2. Roger's Pass, Mont.**—*M.R.*

6.6–234 551.524.7:551.547:551.510.52/3

Moore, J. G., **Average pressure and temperature of the tropopause.** *Great Britain. Meteorological Research Committee, M.R.P.* 874, Aug. 27, **1954.** 10 p. 9 figs., table, 34 refs. Mimeo. **DWB**—Using all available radiosonde data, obtained by various methods, average pressures and temperatures at the tropopause (or 2 tropopauses) are plotted on Mercator world charts and polar charts for Jan., April, July and Oct., and isolines drawn. Between latitudes 35° and 45°, two tropopauses were found on 10–95% of occasions. The charts are discussed. *Subject Headings:* **1. Tropopause pressure charts 2. Tropopause temperature charts.**—*C.E.P.B.*

SOIL TEMPERATURE

See also: **Plant climate** (Searle), 6.6–83; **Irregularities in annual variation of grass, air & soil temp.** (Lawrence), 6.6–301.

6.6–235 551.525.4

Howe, G. Melvyn, **Soil-warmth in sunny and shaded situations.** *Weather*, 10(2):49–52, Feb. **1955.** fig. **DWB**—Soil thermometers were installed 2 in. deep in shaded and sunny parts of a bare slope facing S at Aberystwyth, Wales. Daily values are plotted with air temperature and weather. In fair weather the sunny slope showed a marked daily range (up to 20°F compared with about 5° in shaded site). *Subject Headings:* **1. Soil temperatures 2. Aberystwyth, Wales.**—*C.E.P.B.*

WATER TEMPERATURE

See also: **Temp. data** (Texas Agricult. & Mechanical Coll.), 6.6-237; **Water movement in lakes** (Diémert, Guillerd), 6.6–246; **Oceanographic conditions, mouth of Kitakami River** (Sasaki).

6.6–236 551.526.3:551.481.1

Kolesnikov, A. G. and Pivovarov, A. A., **K raschetu osennego okhlazhdeniia vodokhranilishch.** [Calculations of the cooling of reservoirs during autumn.] *Akademiia Nauk, SSSR, Doklady*, Moscow, 93(6):1015–1018, Dec. 21, **1953.** ref., 12 eqs. **DLC**—The period of ice formation is an important one, but its beginning cannot be determined without taking into account the characteristics of the preceding autumn when water is cooling. This period is analyzed for a water body with depth "h" and of sufficient extent. Equations are based on the values of total radiation, effective radiation from pyrgeometer, air temperature, water vapor pressure and wind velocity. Heat extension is governed by turbulent exchange of such intensity that the coefficient of exchange K_1 does not depend upon depth. The author derives equations for calculation of water temperature variations with depth and with time during the entire autumn cooling period. *Subject Headings:* **1. Water temperature variations 2. Ice formation 3. Lakes and reservoirs.**—*N.T.Z.*

6.6–237 551.526.6(263):551.524.2

*Texas. Agricultural and Mechanical College. Dept. of Oceanography, **Temperature data, Dec. 1950 to Sept. 1952.** Contract N7onr-47804, Project NR 083-071, Project 30, Study of Transfer Processes Operating at the Ocean Boundaries, Data Report—Section 1, Dec. **1952.** 107 p. entirely tables. **DWB**—Temperature data (07) obtained every 2 hours at 60, 44, 36, 28, 20 and 16 ft above bottom in air; at air-water interface; and in water at 8 ft and 1 ft above the bottom; on the bottom and $1\frac{1}{2}$, $2\frac{1}{2}$, 5 and 10 ft below the bottom (in sediments), are presented in detailed tables. The measurements were made at an offshore oil drilling platform 15 miles south of Point Chebreuil and 8 miles west of Point Au Fer, Louisiana. Mean water level is about 12 ft. Daily means are given, but no monthly averages appear in the report. *Subject Headings:* **1. Air temperatures 2. Water temperatures 3. Ocean floor temperatures 4. Oil drilling platform observations 5. Gulf of Mexico.**—*M.R.*

PRESSURE AND WIND

PRESSURE

See also: **Pressure changes** (Haarlaender), 6.6–163; **Atmospheric disturbances** (Mosetti), 6.6–175; **Atmos. tides & hurricanes** (Smiley), 6.6–184; **Interdiurnal variability of temp. in Japan** (Nagao); 6.6–225; **Average pressure & temp. of tropopause** (Moore), 6.6–234.

6.6–238 551.547:523.51:621.396.8

Kaiser, T. R., **Theory of the meteor height distribution obtained from radio-echo observations,** pt. 1–2. *Royal Astronomical Society, Monthly Notices*, 114(1):39–62, **1954.** 12

figs., 15 refs., 61 eqs. **DWB**—The radio-echo height distribution for a homogeneous meteor stream is shown to be a function only of the atmospheric scale height and the mass distribution of the meteors. The results enable the observed dependence of the mean height on the velocity to be interpreted in terms of the variation of atmospheric pressure with height. For results see: Evans, S. (*item* 6.6–239). *Subject Headings:* **1. Radio echoes from meteors 2. Upper air pressure.**—*C.E.P.B.*

6.6–239 551.547:523.51:621.396.8

Evans, S., **Scale heights and pressures in the upper atmosphere from radio-echo observations of meteors.** *Royal Astronomical Society, Monthly Notices*, 114(1):63–73, **1954.** 5 figs., 4 tables, 12 refs., 13 eqs. **DWB**—The method developed by KAISER (*item* 6.6–238) was applied to a number of meteor showers at Jodrell Bank. Pressure p at characteristic height H is given by:

$$\log_{10} p = 11.42 + \tfrac{1}{8}\log_{10} H - 2 \log v.$$

Log p (dynes.cm^{-2}) calculated by this equation is plotted against height, increasing from -0.1 at 99 km to $+0.65$ at 88 km. Atmospheric densities calculated for the same range exceed those given by rocket data at New Mexico but the difference is only of the order of the standard deviation. They are considerably less than those given by photographic meteor observations over Massachusetts. *Subject Headings:* **1. Radio echoes from meteors 2. Upper air pressure.**—*C.E.P.B.*

WIND

See also: **Nomograms** (Einrich), 6.6–55.

6.6–240 551.551:532.517.4

Proudman, Ian and Reid, W. H., **On the decay of a normally distributed and homogeneous turbulent velocity field.** *Royal Society of London, Philosophical Transactions, Ser. A*, 247(926): 163–189, Nov. 4, **1954.** 6 figs., 17 refs., 112 eqs. **DWB**—The paper examines the kinematical and dynamical relations in a field of homogeneous turbulence in which the joint-probability distribution of the velocity components at three points is approximately normal. The decay of isotropic turbulence at large Reynolds numbers, including the exact solution of the inviscid equations for vorticity, is deduced and shown to be consistent with the predictions of KOLMOGOROV's theory. Energy transfer between eddies of different sizes is examined. It is shown that the magnitude of this transfer is such that large eddies are not permanent during decay. *Subject Headings:* **1. Turbulence theory 2. Kolmogorov's theory.**—*C.E.P.B.*

6.6–241 551.552:551.588.2

Kaiser, Heinz, **Über die Strömungsverhältnisse im Bergland.** [On flow conditions in mountain country.] *Meteorologische Rundschau*, 7(11/12):214–217, Nov./Dec. **1954.** 8 figs., 12 refs. **MH-BH**—Wind measurements round Essen 1.5 m above ground with instruments 50–150 m apart are described. Sections show velocity profiles on the lee side of small ridges, one with a wind break causing turbulence, in a valley, on windward side of a hill and on terraces. On lee side with a wind of 5–10 m/s there is a minimum 200–350 m and maximum 500–600 m from the crest. Excess wind of 50–65% on windward extends up to 100 m down wind from the crest. Shape of slope (concave or convex) is important. *Subject Headings:* **1. Topographic effects 2. Wind fields 3. Essen, Germany.**—*C.E.P.B.*

6.6–242 551.553.6:551.582(497.1)

Johnston, W. B. and Crkvencic, I., **Changing peasant agriculture in Northwestern and Hrvatsko Primorje, Yugoslavia.** *Geographical Review*, 44(3):352–372, July **1954.** 8 figs., 20 refs. **DLC**—On p. 355–357 there is a brief sketch of climate of area about Crkvenica, with a novel type seasonal wind rose (based on 1925–40 data). The wind rose reveals the almost complete bi-directional character of the winds: NE in the cold season (Bora) and SE the rest of the time (Jugo). *Subject Headings:* **1. Wind roses 2. Climatological sketches 3. Bora 4. Crkvenica, Yugoslavia 5. Croatian coast, Yugoslavia.**—*M.R.*

6.6–243 551.555.8:551.311.3

Finnel, H. H., **The dust storms of 1954.** *Scientific American*, 191(1):25–29, July **1954.** figs. **DLC**—In this general article on the reappearance of the dust bowl in the Panhandle region of Texas and Oklahoma and adjacent Colorado, Kansas and New Mexico, the problem of cultivation of semi-arid land is discussed and illustrated. The loss of productivity from wind erosion exceeds the loss of fertility from other sources. A map shows the areas of varying degrees of dust erosion in the past few years, with average annual isohyets superimposed. The less the annual rainfall the greater the risk of wind erosion if land is ploughed. Four classes of land are defined with respect to need for care to prevent wind erosion. Most of the dust and damage occurs in Class IV which needs extreme care to prevent damage. Soil type, slope, etc., vary the classifications, as well as rainfall. Future of dust bowl depends on: (a) continuing drought or rainy periods and (b) cultivation practices. *Subject Headings:* **1. Wind erosion 2. Dust storms 3. Great Plains, United States.**—*M.R.*

WIND EFFECTS

See also: **Atmos. turbulence** (Ishida, others), 6.6–46; **Sea-breeze forecasting** (Watts), 6.6–124.

6.6–244 551.556:551.48

Bell, Geoffrey, **A wind-produced "line" on water.** *Weather*, 9(12):386, Dec. **1954.** fig., plate. **DWB**—The "line" appears on surface of a well 6 ft across in a shallow depression on cliff-top in Cornwall. It is at right angles to wind direction and is attributed to an eddy sweeping slight surface contamination into a limited area. *Subject Heading:* **1. Wind streaks.** —*C.E.P.B.*

6.6–245 551.556:532.5

Blanc, Jean-Joseph, **Hydrodynamique et sédimentation des fonds de calanques.** [Hydrodynamic phenomena and sedimentation at the bottom of coves.] *Académie des Sciences, Paris, Comptes Rendus*, 237(19):1173–1175, Nov. 9, **1953. DWB**—The coves investigated have NNW–SSE orientation. Water movement in the coves during easterly wind is analyzed (surface movement and undertow). *Subject Heading:* **1. Hydrodynamics of coves.**—*G.T.*

6.6–246 551.556:551.481.1 551.526.8

Diénert, M. F. and Guillerd, A., **Mouvement de l'eau dans les lacs.** [Water movement in lakes.] *I.U.G.G., International Association of Scientific Hydrology, Transactions, Oslo 1948*, 1:379–385, [n.d.] fig., tables, refs. **DWB**—Discusses currents in Lake of Geneva caused by winds and gives some temperature data. *Subject Headings:* **1. Lake currents 2. Lake temperatures 3. Lake of Geneva, Switzerland.**—*A.A.*

6.6–247 551.556:532.59:551.468

Griesseier, Helmut and Vollbrecht, Kurt, **Über einige neuere Gesichtspunkte in der Küstenforschung.** [On some new viewpoints in coastal investigation.] *Forschungen und Fortschritte*, Berlin, 29(1):5–12, Jan. **1955.** 6 figs., 13 refs., 9 eqs. [Continuation], *Ibid.*, 29(2):37–43, Feb. **1955.** 9 refs. **DLC**—This summary deals first with the paths of particles and the forces exerted in waves in moderately deep, deep, and shallow water, the disturbing effect of a sloping sea floor, the formation of breakers, and the development of coastal currents. Relevant equations are set out. Authors then discuss the equilibrium profile of deposits on the sea floor and the transport of material along the coast. *Subject Headings:* **1. Wind waves 2. Coastal effects.**—*C.E.P.B.*

6.6–248 551.556:525.3:525.6:529.7

Mintz, Yale and Munk, Walter, **The effect of winds and bodily tides on the annual variation in the length of day.** *Royal Astronomical Society, Monthly Notices, Geophysical Supplement*, 6(9):566–578, April **1954.** 4 figs., 2 tables, refs., 13 eqs. **DWB**—Variation in angular velocity of the atmosphere (mainly in the jet stream) causes an annual variation in length of day by 0.7 millisec. Relative westerly zonal winds for each latitude are calculated

for Jan., April, July and Oct. Monthly calculations show maximum angular momentum in early Feb. and minimum in late July. The effect of obliquity of the earth's orbit on the bodily tides is the next most important cause; shifts of mass of atmosphere and ocean are unimportant. Computed and observed annual variations are in good agreement. *Subject Headings:* **1. Wind effects 2. Length of day.**—*C.E.P.B.*

6.6–249 551.556:532.593

§*Pierson, Willard J., Jr., **Accuracy of present wave forecasting methods with reference to problems in beach erosion on the New Jersey and Long Island Coasts.** *U. S. Beach Erosion Board, Technical Memorandum*, No. 24, April **1951.** 76 p. 27 figs., 19 refs. **DWB**—A comparison of observed and forecast wave height direction and period for April 22–May 31, 1948, shows that there is sufficient agreement in height forecast to use the latter for the forecast of wave refraction for beach erosion studies. Along the Atlantic coast comparison is shown graphically. Methods of observation, analysis and forecasting wave heights, and especially hurricane induced waves, are set forth, with examples accompanied by synoptic charts (4 times daily) and hourly weather data of two types of East Coast storms affecting Long Island on May 4–8 and 13–16, 1948, and a hurricane which passed off at sea in May 24–29, 1948 is analyzed to illustrate the effects. Period forecasts (by Sverdrup-Munk method or extensions thereof) were not as accurate as a simple climatological average of all observed periods. *Subject Headings:* **1. Ocean wave forecasting techniques 2. Forecast accuracy 3. Beach erosion 4. Long Island, N. Y.**—*M.R.*

6.6–250 551.556:532.593 551.526(52):551.482

Sasaki, K., **On the oceanographical condition at the estuary of the River Kitakami.** *Journal of Meteorological Research*, Tokyo, 4(5):251–247, Aug. **1952.** 6 figs., 5 tables. In Japanese; English summary p. (16–17). **MH-BH**—Data on directional, frequency and velocity distribution of wind, on directional distribution and monthly frequency of wind waves, and on frequency and height of swell for various directions, are presented for the period of 1939–1948. A formula expressing the energy of swell as a function of wave length and height, is offered. Finally, temperatures of sea, river, and coast water are graphically compared for the period Nov. 1949–Sept. 1950. Neither river water temperature nor rise or fall of tide is found to have a significant effect on the temperature of coastal water. *Subject Headings:* **1. Estuaries 2. Wind waves 3. Water temperatures 4. Kitakami River, Japan.**—*G.T.*

6.6–251 551.556:551.465:532.593

*Saville, Thorndike, Jr. (*U. S. Beach Erosion Board*), **Hindcast wave statistics for the Great Lakes.** *Coastal Engineering Conference, 4th, Chicago, Oct. 1953, Proceedings*, p. 1–12. pub. **1954.** 5 figs., 2 tables, refs., eqs. **DWB**—Review of the Technical Memoranda of the Beach Erosion Board (Saville, 1953) on wave and water level conditions in Lakes Michigan (5 stations), Erie (4 stations) and Ontario (3 stations). The memoranda are reported to contain hindcasts of wave characteristics prepared from synoptic weather charts (1948–1950), data on ice-free periods, direction and height frequencies of waves, deep-water energy amounts, etc. Sample figures and tables are reproduced in this review. *Subject Headings:* **1. Wave data 2. Wave forecasting 3. Great Lakes.**—*G.T.*

6.6–252 551.556:621.17

Wood, B., **A contribution to the theory of natural draught cooling towers.** *Engineer*, 189(4916):455–457, **1950. DLC**—Besides theoretical considerations on heat transfer in cooling towers, considering moisture conditions, the influence of the wind is briefly discussed. *Subject Headings:* **1. Industrial meteorology 2. Wind effects 3. Cooling towers.**—*A.A.*

UPPER AIR WINDS

See also: **Acoustic wind measurem.** (Van dem Borne), 6.6–58.

6.6–253 551.557:551.576.5:629.13

Frost, Bernard C., **More about the jet stream.** *Shell Aviation News*, London, No. 195: 14–18, **1954.** 12 figs. **DWB**—A general description is given of the meandering polar jet

stream, illustrated by the author's own flying experiences, photos of jet stream clouds, and diagrammatic sketches. Effect on flying time is discussed. *Subject Headings:* **1. Jet stream 2. Jet stream clouds.**—*C.E.P.B.*

6.6–254 551.557(729)

Griffiths, P. S., **Upper winds over Trinidad.** *Meteorological Magazine*, London, 84(992): 57–58, Feb. 1955. **DWB**—Upper winds at 40,000–50,000 ft observed by radiosonde are described. Westerly winds exceeding 50 kt occurred on 3 occasions. *Subject Headings:* **1. Upper air winds 2. Trinidad.**—*C.E.P.B.*

6.6–255 551.557:523.51

Kaiser, T. R., **A symposium on meteor physics at Jodrell Bank.** *Observatory*, London, 74(882):195–208, Oct. 1954. photo. **DWB**—Summary of sessions on July 20–22, 1954. Under "General problems in meteor physics" Dr. THOMAS reviewed knowledge of heat transfer and ablation, A. F. COOK spoke on "The nature of meteoric radiation," E. ÖPIK contributed a paper on "Meteor ionization and excitation" and he and others discussed masses of meteors. Under "Radio echo investigations: ionization and excitation" a number of contributions were discussed. Under "Meteors and the upper atmosphere", scale height determinations, densities, velocity, upper winds, turbulence and ionospheric effects were discussed. Other sessions dealt with "Astronomical problems of meteors" and "Meteors and the International Geophysical Year." *Subject Headings:* **1. Meteor investigations 2. Symposia.**—*C.E.P.B.*

6.6–256 551.557.3(567)

Jenkinson, A. F., **A note on summer weather in the Euphrates valley.** *Meteorological Magazine*, London, 84(992):41–42, Feb. 1955. fig., table, ref. **DWB**—Passage of a depression eastward across Ukraine is followed by strong NW winds in Euphrates valley with sandstorms. At higher levels a SE thermal wind develops. With light surface wind a westerly thermal prevails. Tephigrams are shown. *Subject Headings:* **1. Upper air wind variations 2. Euphrates Valley, Iraq.**—*C.E.P.B.*

6.6–257 551.558.1

MacCready, Paul B., Jr., **High and low elevations as thermal source regions.** *Weather*, 10(2):35–40, Feb. 1955. fig., ref. **DWB**—Thermals are commoner, stronger and higher over mountains than lowland. This is due partly to mechanical and thermal slope effects and partly to higher potential temperature on warmed heights compared with valleys. A convective cloud base height chart is given. The pressure build up over a warmed height is compared to that over land during sea breeze. Some remarks on breeding ground for thermals for gliders are added. *Subject Heading:* **1. Thermals.**—*C.E.P.B.*

AQUEOUS VAPOR AND HYDROMETEORS

HUMIDITY AND CONDENSATION

See also: **Upper air temp. & humidity** (Emon), 6.6–13; **Rain-making** (Banerji), 6.6–128; **Regulation of sweat production in man** (Kerslane), 6.6–220; **Refraction and the spider** (Monteith), 6.6–326.

6.6–258 551.571.7:551.510.53

Murgatroyd, R. J.; Goldsmith, P. and Hollings, W. E. H., **An interim report on measurements of humidity from aircraft to heights of about 50,000 feet over southern England.** *Great Britain. Meteorological Research Committee, M.R.P.* 877, Sept. 9, 1954. 11 p. 4 figs., 2 tables, 6 refs. Mimeo. **DWB**—Regular observations with Dobson-Brewer pressurized hygrometer in a Canberra up to 50,000 ft over S. England are described. Observations at 5000 to 50,000 ft are tabulated and discussed for 21 flights. At tropopause, frost point ranged from −65 to −96°F lower for high than low tropopause. About 50,000 ft (100 mb above tropopause) values cluster round −120°F (relative humidity over ice at −60°F 0.7%). There may be a "humidity tropopause" a few thousand feet above temperature tropopause. *Subject Headings:* **1. Stratosphere humidity 2. England.**—*C.E.P.B.*

6.6–259 551.574.1:551.594.12

Blanchard, Duncan C., **Electrified droplets from the bursting of bubbles at an air-sea water interface.** *Nature*, London, 175(4451):334–336, Feb. 19, 1955. 2 figs., 4 refs. **DWB**—Determination of electric charge on droplets formed by breaking up of vertical jet from bursting bubbles is described. Charge is plotted against drop radius (1–100μ), including charge induced by a field. Droplets from smallest bubbles are positively charged and this charge carried upwards by wind or turbulence over the oceans may contribute significantly to the earth's supply current. *Subject Headings:* **1. Saline nuclei 2. Electrical charges on drops 3. Bursting bubbles.**—*C.E.P.B.*

6.6–260 551.574.1:551.515.8

Rau, Walter, **Die Gefrierkerngehalte der verschiedenen Luftmassen.** [The freezing nuclei content of the different air masses.] *Meteorologische Rundschau*, 7(11/12):205–211, Nov./Dec. **1954.** 14 figs., 7 refs. **MH-BH**—At Weissenau number of nuclei effective at different degrees of supercooling may remain nearly constant for several days but at times, e.g., with passage of a front, may vary by several powers of 10. The main maximum is at −18 to −27°C with a secondary maximum at −41 to −42°C. These variations are not related to local (human) influences or to variations of individual elements but are caused by changes of air mass. Nuclei in polar air are effective at higher temperatures than those in maritime subtropical air; this applies to a less extent to modified air. It explains the opposite annual variation of temperature and mean freezing nuclei content. *Subject Headings:* **1. Freezing nuclei 2. Air mass properties 3. Weissenau, Germany.**—*C.E.P.B.*

FOG

See: **Fog studies** (Nurminen), 6.6–9; **Fog and smog** (Kelley), 6.6–144; **Contaminated fog** (Pilpel), 6.6–150; **Smog** (Scorer), 6.6–151; **Time variation of vertical current . . . in fog** (Reiter), 6.6–232.

CLOUDS

See also: **Thunderstorm forecasting** (Hauer), 6.6–123; **Instability** (Pedgley), 6.6–165; **Jet stream** (Frost), 6.6–253; *also* special bibliography on *Cloud Physics*, p. 807.

6.6–261 551.576.1:778.3

Cirrocumulus cloud at Cranwell. *Meteorological Magazine*, London, 84(992):60, Feb. **1955.** 2 photos. **DWB**—Photos of CiCu cloud on Nov. 15, 1954. *Subject Headings:* **1. Cirrocumulus cloud 2. Cloud photographs 3. Cranwell, England.**—*C.E.P.B.*

6.6–262 551.576.11:629.13

Ashmore, S. E., **Peculiar contrails.** *Weather*, 10(2):63, Feb. **1955.** fig. **DWB**—Description of a double contrail which in 20 sec developed into a series of caliper shapes, possibly due to clear-air turbulence. *Subject Heading:* **1. Condensation trails.**—*C.E.P.B.*

6.6–263 551.576.11:629.13

Harper, R. D. M., **Circular condensation trails.** *Meteorological Magazine*, London, 84(992):56–57, Feb. **1955.** **DWB**—Gives further details of condensation trails described by N. F. Hormbrey. (*See item* 6.2–254, Feb. 1955, *MAB.*) *Subject Headings:* **1. Condensation trails 2. Vortexes. I. Hormbrey, N. F.**—*C.E.P.B.*

6.6–264 551.576.11:629.13

Stuart, J. M. and Jones, R. F., **Distrails.** *Meteorological Magazine*, London, 84(992): 58–59, Feb. **1955.** 3 photos, ref. **DWB**—Photos of distrails formed at 18,000 ft over Luce Bay are reproduced. They are attributed to ice-crystal seeding of supercooled drops causing them to grow and fall out of the cloud. *Subject Heading:* **1. Distrails.**—*C.E.P.B.*

PRECIPITATION

See also: **Drought forecasting** (Debski), 6.6–119; **Drought prevention** (Toma), 6.6–125; **Cloud seeding** (Langmuir), 6.6–135; **Precip. structure** (Schulte-Vennbur), 6.6–178; **Hydromet. study, Great Salt Lake** (Peck), 6.6–282.

6.6–265 551.577.2:631(676)

Middleton, J. F. M. and Greenland, D. J., **Land and population in west Nile district, Uganda.** *Geographical Journal*, 120(4):446–457, Dec. **1954.** 3 figs., 3 tables. Discussion p. 455–457. **DWB**—Account of an expedition to survey land shortage and overpopulation. Soil fertility is discussed in relation to topography, agricultural practice and rainfall. A rainfall map is included with monthly histograms for 8 stations. *Subject Headings:* **1. Rainfall distribution 2. Agriculture 3. Uganda.**—*C.E.P.B.*

6.6–266 551.577.2(52)

§*Yagi, H.; Watanabe, K.; Terauchi, E. and Sakaguchi, K., **On the heavy rainfall occurred in the latter half of July in Kyushu, Southern Kinki, Chyubu and Hokuriku Districts.** *Japan. Central Meteorological Observatory, Tokyo, Memoirs*, 38(3/4):343–358, July **1954.** In Japanese; legends and summary in English. 11 figs., 2 tables. **DWB**—Charts of daily rainfall distribution, synoptic pressure and dew-point temperature charts for various pressure levels, charts showing relation between position of trough and rainfall area, a graph of precipitation amount as a function of height above sea level, and other data are presented in this analysis of heavy rainfall connected with the re-activation of the Baiu front, July 17–23, 1953. The report includes a detailed analysis of the mechanism of a cloudburst in Kinki District on July 18, 1953. *Subject Headings:* **1. Rainfall distribution 2. Excessive rainfall 3. Bai-u 4. Japan.** —*G.T.*

6.6–267 551.577.3:631.6

Lockie, G. D., **Irrigation for salad and other intensive cropping.** *Agriculture*, London, 61(7):322–328, Oct. **1954. DA**—A discussion of the technique of irrigation of green crops against drought or excessive heat in summer or frost in spring. Questions of cost are examined. *Subject Heading:* **1. Irrigation.**—*C.E.P.B.*

6.6–268 551.577.37

§Lott, George A. (*U. S. W. B., Wash., D. C., Hydrologic Serv. Div.*), **The unparalleled Thrall, Texas rainstorm.** *Monthly Weather Review*, 81(7):195–203, July **1953.** 14 figs., 7 refs. **DWB**—A detailed study of the largest rainstorm observed in the United States in the terms of the depth-duration-area relation, which occurred in Sept. 1921. The synoptic patterns are characterized by surface maps, isallobaric charts and by the distribution of surface temperature. Upper air conditions are shown by a sounding and a time-cross section of wind, temperature and relative humidity. One of the deciding factors, besides local conditions, was a katallobaric system of tropical hurricane origin. *Subject Headings:* **1. Record rainstorms 2. Maximum rainfall 3. Synoptic studies 4. Thrall, Texas.**—*A.A.*

6.6–269 551.577.37

Marchetti, Adolfo A. (*Argentine Nat. Met. Ser.*), **Probabilidad de la lluvias intensas en la Ciudad de Buenos Aires.** [Probability of heavy rains in Buenos Aires.] *Meteoros*, Buenos Aires, 3(2/3):131–134, April/Sept. **1953.** 2 figs. English summary p. 131. **DWB**—A continuation of a previous article (*see item* 4.6–175, June 1953, *MAB*). Using the rainfall data at Buenos Aires for the period 1921–1950, the author investigated the probabilities of intense rainfalls of short duration, namely 5, 10, 15, 20, 30, 45, 60, 90 and 120 minutes. The calculated results are represented on a probability chart from which the probability of the specified intensities can be read off. *Subject Headings:* **1. Rain duration intensity frequencies 2. Rainfall probability 3. Buenos Aires, Argentina.**—*I.L.D.*

6.6–270 551.577.37:551.579.4(52)

*Okanoue, M., **Meteorology (Aso District).** *Tokyo. Forest Experiment Station, Bulletin*, No. 69, A study of the June flood, 1953, in Kyushu, March **1954,** p. 21–39. 16 figs., 13 tables,

7 refs. In Japanese; English summary p. 39. Also his: **Meteorology (Moji District).** *Ibid.*, p. 309–322. 14 figs., 4 tables, 3 refs. In Japanese; English summary p. 322. **DWB**—A large number of landslides occurred in Mt. Aso on June 26, 1953. The weather, specially rainfall of that time was investigated, and it was found that: 1) the "Bai-u" of that year started on May 27 and continued for almost two months; 2) the Bai-u front stagnated between central and northern regions of Kyushu from June 24 to 28, and record breaking violent rainstorms occurred in those regions. Some of them broke all the previous records specially at Aso and Kumamoto, and 3) landslides occurred due to violent rainstorms after a month of rainy days. A large number of landslides also occurred at Moji City on June 28, 1953. Same information for Moji District is given. *Subject Headings:* **1. Rainfall extremes 2. Floods, Kyushu, Japan (June 1953) 3. Record rainfall 4. Bai-u 5. Landslides 6. Kyushu, Japan.** —*Author's abstract.*

6.6–271 551.577.37(433)

Schweitzer, H., **Die Hochwasserkatastrophe in Bayern im Juli 1954.** [The flood catastrophe in Bavaria in July 1954.] *Umschau*, 54(16):503–504, Aug. 15, **1954.** 4 figs. **DLC**—The mechanics of production of heavy rain in the Danube valley and Bavarian Alpine foreland is simply explained by meeting of cold and warm air and divergence at 300 mb to form a secondary depression. Rainfall was up to 282 mm in 4 days (7th–11th). Ultimate cause may be sunspot activity. *Subject Headings:* **1. Excessive precipitation 2. Danube Valley, Bavaria, Germany.**—*C.E.P.B.*

6.6–272 551.577.37:06

U. S. Weather Bureau. Hydrometeorological Section, **Seasonal variation of the standard Project Storm for areas of 200 and 1000 square miles east of 105 meridian.** *U. S. Weather Bureau, Hydrometeorological Report*, No. 29 (rev.), March **1953.** 4 p. 27 figs. Mimeo. **DWB**—Monthly charts are presented for the Eastern States, which give the maximum possible rainfall over 200 and 1000 square miles in percentages from the standard Project Storm rainfall isohyets, previously adopted by the U. S. Corps of Engineers. *Subject Headings:* **1. Maximum rainfall 2. Project Storm 3. Eastern United States.**—*A.A.*

6.6–273 551.577.38

Orechia Buro, Helido Antonio, **La Sequia, Hacia un estudio integral de las sequias.** [Drought. An integrated study of droughts.] *Revista Orientación Meteorológica*, Montevideo, No. 7:11–12, June **1954. MH-BH**—General discussion of drought and of factors determining the severity of its effect on vegetation. The use of the five-day period (introduced by J. M. Bergeiro) as a basic unit for agro-climatological studies is advocated. *Subject Heading:* **1. Drought.**—*G.T.*

6.6–274 551.578.13:632.72

Knipper, Helmut, **Die Bekämpfung der "Roten Wanderheuschrecke."** [Fighting the red locust.] *Umschau*, 55(3):70–73, Feb. 1, **1955.** 6 figs., 4 refs. **DLC**—The work of International Red Locust Control Service, centered at Abercorn, Tanganyika, is described. Possible effect of variations of rainfall on migration of swarms is briefly discussed. *Subject Headings:* **1. Locust control 2. Abercorn, Tanganyika.**—*C.E.P.B.*

SNOW

See also: **Snow research** (De Quervain), 6.6–22; **Snow census** (Forbes), 6.6–44; **Water conditions . . .** (Calif. Dept. of Publ. Works), 6.6–47; **Electrification of snow** (Norinder, Siksna), 6.6–337.

6.6–275 551.578.4 551.589.5

Knepple, Rudolf, **Das winterliche Mecklenburg.** [Mecklenburg in winter.] *Zeitschrift für Meteorologie*, 7(10):298–307, Oct. **1953.** 6 figs., 2 tables. **MH-BH**—A climatic study of snow conditions. The occurrence of snow fall and the height of the snow cover is indicated for each day of the winters 1901–30 in Schwerin. The probability of snowfall is computed

for 10 main weather situations, as well as for wind directions. The frequency of snowfall on each calendar day is given for 4 stations. *Subject Headings:* **1. Snow frequencies 2. Synoptic climatology 3. Singularities 4. Long period records 5. Schwerin, Germany 6. Mecklenburg, Germany.**—*A.A.*

6.6–276 551.578.4:003.62

U. S. Corps of Engineers. Snow Investigations, **Standard list of snow hydrology symbols.** June 30, **1954.** 4 p. Mimeo. **DWB**—The purpose of this list is to secure uniformity in the use of letter symbols in reports of the Snow Investigations unit. The symbols are listed in alphabetical order, with their interpretation indicated. The concepts covered by the list concern the physical status of snow and atmosphere, thermal and radiation processes, etc. More than 80 symbols are included. *Subject Headings:* **1. Snow and ice research 2. Code manuals.**—*G.T.*

6.6–277 551.311.12 551.578.42(235.243)

Roch, André, **The glaciers, snow and avalanches of Mount Everest.** *Journal of Glaciology*, 2(16):428–430, Oct. **1954.** 6 photos. **DWB**—Formation of pentitentes is described. Annual snowfall is estimated as 2.1 m of water. Avalanche risk is emphasized. *Subject Headings:* **1. Glaciers 2. Snow 3. Mt. Everest, Himalayas.**—*C.E.P.B.*

6.6–278 551.578.45(74)

*§U. S. Weather Bureau, **Storm of November 6–7, 1953.** N. Y., U. S. Weather Bureau, [**1953**]. 35 p. tables, graphs, charts. **DWB**—A brief summary of the origin, development progress and consequences of the trick storm of Nov. 6–7, 1953 which gave heavy snow, high winds and tides to the Washington, D. C.–New York–New England area. The fact that snow is unusual so early in the season (record for 82 years was broken) and the retrograde (to NNW) movement of a storm which was expected to move NE, caught the forecasters unawares. Surface synoptic charts are reproduced for each 6 hour period from 0.30 on Nov. 5 to 1930 EST on Nov. 7. All forecasts and weather report sequences as well as climatic data are reproduced. The most important factor in the development and movement was the intense flow of cold air from the continent over warm coastal waters. *Subject Headings:* **1. Severe snowstorms 2. Cyclogenesis 3. Snowstorms, Eastern United States (Nov. 6–7, 1953) 4. Synoptic studies 5. North Atlantic States.**—*M.R.*

6.6–279 551.578.7:629.135

Laird, H. B. (*U. S. W. B., Denver, Colo.*), **Aircraft encounters with severe hailstorms.** *Weatherwise*, 7(2):27–30, 40, April **1954.** figs. **MH-BH**—Hailstorms encountered between Casper and Cheyenne, Wyo., on evening of May 20, 1948, broke windshield of plane, shredded ailerons and elevators and did great damage to nose and wings. Wings were beyond repair. A pilot noticed hail still on ground in that area the following day, and hail-drifts 3 feet deep were reported along highway. Synoptic and aerological conditions attending this storm—one of the worst in the area ever reported—are reviewed. A similar occurrence on June 27, 1951, near Pueblo, Colo., was described by another pilot. In both cases strong upslope near-frontal weather was attended by strong local surface heating and dry air above 10,000 ft. Two radar-scope pictures of hailstorms in area are reproduced. *Subject Headings:* **1. Hail damage to aircraft 2. Hail occurrences 3. Hailstorms 4. Wyoming 5. Pueblo, Colo.**—*M.R.*

HYDROMETEOROLOGY

See also: **Water conditions . . .** (Calif. Dept. of Publ. Works), 6.6–47; **Drought forecast** (Debski), 6.6–119; **Weather modification . . .** (Krick), 6.6–134; **Meteorology** (Okanoue), 6.6–270.

6.6–280 551.579.4:519.241

Hahn, Arthur, **Gewässerkundliche Statistik.** [Hydrological statistics.] *Oesterreichische Wasserwirtschaft*, Vienna, 6(1/2):10–15, **1954.** **DLC**—The application of various statistical measures to water supply statistics is briefly described. They include simple and weighted

means, mode, median, running means of 12 months, measures of dispersion and extremes. Straight line trends and correlation coefficients are explained. Various methods of graphical representation are set out. *Subject Headings:* **1. Floods 2. Statistical techniques.**—*C.E.P.B.*

6.6–281 551.579.4

Pardé, Maurice (*Grenoble Univ.*), **Crues désastreuses de la Kansas River et de quelques rivières voisines.** [Disastrous floods of the Kansas River and neighboring rivers.] *Revue pour l'Étude des Calamités*, Geneva, 13(30/31):52–80, Jan. **1952**/Dec. **1953.** 9 figs., table. **DWB**—After a general discussion of torrential rains and summer floods in the U. S. Midwest and of the Kansas River floods of May–June 1935 and May–June 1903, the author describes the disastrous floods of July 1951. Developments of rainfall and of the synoptic situation are discussed and illustrated. The extent of the floods is sized up in terms of hydrologic data for several stations in the Kansas River basin. Amount of damage is indicated and compared with damage caused by other floods in U. S. and abroad. The study is based on official reports from several U. S. agencies. *Subject Headings:* **1. Floods 2. Excessive rainfall 3. Kansas River Basin.**—*G.T.*

6.6–282 551.579.4:551.509.58:551.577.3(792)

*Peck, Eugene Lincoln, **Hydrometeorological study of Great Salt Lake.** Thesis (M.S.)—Utah, University, Dept. of Meteorology, **1951.** 54 p. 13 figs., 8 tables, 17 refs. **DWB**—A method of forecasting water level developed by the U. S. Weather Bureau is applied to the Great Salt Lake. Precipitation, evaporation and other data are examined and an index for the final relation between rainfall and water level determined. The preparing of forecasts and average errors involved are discussed. It is found that slightly less than one-third of the water-year volume change in the lake is due to the previous year's precipitation. Data are presented for long periods up to 35 years. *Subject Headings:* **1. Hydrometeorology 2. Water level forecasting 3. Precipitation effects 4. Great Salt Lake, Utah.**—*G.T.*

6.6–283 551.579.4:551.509.58(826.3)

Raffo, Jose Maria, **Prognóstico de crecientes del Rio Chubut.** [Predicting the rise in water level of the Chubut River.] *Meteoros*, Buenos Aires, 2(3/4):204–208, July/Dec. **1952.** 2 figs. English summary p. 204. **DWB**—Hydrographs and regression formulas are given for forecasting the height of water in the Chubut River of Argentina 9 to 10 days in advance with a high degree of accuracy. The incorporation of precipitation and snow melt hydrographs would enable forecasts to be made 2 to 3 months in advance, according to the author. The statistical limits of accuracy of the formulas are given for 5 gaging points on the 1000 km river. *Subject Headings:* **1. River forecasting 2. Hygrographs 3. Chubut River, Argentina.**—*M.R.*

6.6–284 551.579.4(471.1)

Renqvist, Henrik, **On hydrology of floods, Finland.** *I.U.G.G. International Association of Scientific Hydrology, Brussels, 1951,* [*Transactions*], 4:197, **1952.** **DWB**—Short note, describing the slowness of floods in Finland due to the great percentage of lake areas. Nevertheless such floods can cause considerable damage (up to 2 million dollars in 1899). *Subject Headings:* **1. Floods 2. Finland.**—*A.A.*

6.6–285 551.579.4(777)

*Schwob, H. H. (*U. S. Geological Survey*), **Iowa floods, magnitude and frequency.** *Iowa. Highway Research Board, Bulletin*, No. 1, April **1953.** 171 p. 60 figs., 58 tables, refs. **DWB**—Water-stage and discharge values are tabulated for major floods at 58 gaging stations in Iowa (periods of varying length). Frequencies of floods of various magnitude are indicated. General climatic conditions of Iowa are described in a paragraph on p. 5. *Subject Headings:* **1. Flood frequencies 2. Climate of Iowa 3. Iowa.**—*G.T.*

6.6–286 551.579.4

Snyder, Franklin F. (*U. S. Corps of Engineers*), **Large floods from melting snow and rain.** *I.U.G.G. International Association of Scientific Hydrology, Brussels, 1951,* [*Transactions*], 4:179–196, **1952.** 3 figs., 4 tables, refs., 14 eqs. **DWB**—An extensive analysis of conditions

leading to floods from rain and snow, taking into account topographical features, meteorological conditions and developing a heat balance method for the melting of snow. Working formulas for short and long wave radiation, albedo, convection and water vapor exchange are given. A number of snow melt equations for open places and forests are presented. Examples for the American River, Calif., and the Flathead River, Mont., show how to make a hydrograph analysis. *Subject Headings:* **1. Snow melting 2. Floods 3. American River, Calif. 4. Flathead River, Mont.**—*A.A.*

6.6–287 551.579.4:519.2

Todd, David K. (*Univ. of Calif., Div. of Civil Engr. and Irrig.*), **Streamflow frequency distributions in California.** *American Geophysical Union, Transactions*, 34(6):897–905, Dec. **1953.** 10 figs., table, 18 refs., 5 eqs. **MH-BH**—The flow-duration curve as a means of expressing stream-flow distribution is briefly described together with its applications and construction. Flow-duration curves were prepared for a selected group of ten California streams. The shapes of these curves are discussed in relation to the prevailing basin and climatic conditions. To clarify further the analysis, frequency curves in the form of histograms were plotted. The usefulness of the frequency curve over the flow-duration curve for analytical purposes and the need for further study are emphasized. *Subject Headings:* **1. Stream flow 2. Flow duration curves 3. California.**—*Author's abstract.*

6.6–288 551.579.4

*U. S. Weather Bureau, **Critical meteorological conditions for design floods in the Snake River Basin.** Prepared by the Cooperative Studies Section, Hydrologic Services Division. *U. S. Weather Bureau and U. S. Bureau of Reclamation, Cooperative Studies Report*, No. 11, Feb. **1953.** 218 p. 146 figs. (incl. tables), 16 tables, refs. **DWB**—A model sample showing that a great amount of technical information can be derived from carefully analyzed climatic data for the purpose of hydraulic constructions. Maximum possible storm precipitation is derived for the basin, adjusting observed storms to the highest persisting dew point. Maximum water equivalent of snow is computed on the basis of snow surveys; the melting-season temperature excess in the basin of the thermal gradient and altitude-areal curves. A modified approach was adopted for 4 small sub-basins where annual isohyets were constructed on the basis of precipitation-altitude relations (snow courses), serving as a guide to topographic effect on the distribution of storm precipitation. *Subject Headings:* **1. Flood models 2. Maximum snowfall 3. Snow melt runoff 4. Snake River Basin.**—*A.A.*

6.6–289 551.579.4

Wisler, C. O., **Estimating floods of rare frequency.** *I.U.G.G. International Association of Scientific Hydrology, Brussels, 1951,* [*Transactions*], 4:71–75, **1952.** 5 refs. **DWB**—The author proposed to limit the use of probability methods to cases where "discharge records are available covering at least ten times as long as the period for which knowledge of the maximum probable flood is desired." In cases where loss of life or tremendous property damage may be involved, the unit hydrograph-infiltration capacity method should be used as a basis of the most unfavorable design storm rainfall. *Subject Headings:* **1. Maximum floods 2. Unit hydrograph.**—*A.A.*

6.6–290 551.579.5:551.585.5

B—, V. L., **Problems of water supply in the arid areas.** *Geographical Journal*, 120(1): 119–122, March **1954.** 11 refs. **DLC**—Discussion of availability of underground waters and their salinity, in various parts of Africa. *Subject Headings:* **1. Underground water 2. Arid zones 3. Africa.**—*C.E.P.B.*

CLIMATOLOGY AND BIOCLIMATOLOGY

CLIMATOLOGY

6.6–291 551.58(421):63

Smith, L. P., **Our climate.** *Agriculture*, London, 61(6):297–300, Sept. **1954.** 6 figs. **DA**—Farmers are concerned more with frequencies and sequences than with long-period means.

Block diagrams show frequencies of different monthly or summer rainfall amounts and temperatures in May and coldest month, all at Kew, London, 1894–1923 and 1924–1953. Finally the question of trends and a 3-year cycle are briefly discussed. *Subject Headings:* **1. Agricultural climatology 2. Kew Observatory, England.**—*C.E.P.B.*

CLIMATE OF PARTICULAR PLACES

See also: **Changing peasant agriculture, Yugoslavia** (Johnston, Crkvencic), 6.6–242.

6.6–292 551.582(261):656.6

Great Britain. Hydrographic Office, **Newfoundland and Labrador pilot, Vol. 2, Comprising the eastern coast of Newfoundland from Cape Saint Francis to Cape Bauld; Belle Isle; and the eastern and north-eastern coast of Labrador from Cape Saint Charles to Cape Chidley.** 8th ed. London, **1953.** 45+655 p. 49 plates, 18 tables. **GB-MO**—Includes sections on mirage and abnormal refraction, aurora, magnetic storms, a chapter on "General meteorology" p. xxx–xlv (including forecasting sea fog), notes on currents and tidal streams, ice (with 15 photos and charts), ice navigation. The section on "Climate and weather" (p. 49–69) includes full climatic tables for Great Bank, Fogo, Belle Isle, Goose Bay, Cartwright, Hopedale, Hebron and Resolution I. *Subject Headings:* **1. Pilot guides 2. Climate of Newfoundland 3. Climate of Labrador 4. Newfoundland 5. Labrador.**—*C.E.P.B.*

6.6–293 551.582(422.1):656.71

*Great Britain. Ministry of Housing and Local Government, **Report of an enquiry into the proposed development of Gatwick airport.** London, H.M.S.O., *Cmd.* 9215. **1954.** 64 p. 2 figs. **GB-MO**—This report includes a statement by E. GOLD of the meteorological conditions, especially fog and low cloud, at Gatwick, summed up as an opinion that it is a thoroughly bad site. The meteorological conditions were exhaustively discussed by Counsel. *Subject Headings:* **1. Airport climate surveys 2. Gatwick Airport, Sussex, England.**—*C.E.P.B.*

6.6–294 551.582.1(458.1)

Hyde, Herbert P. T., **Malta. Unbesiegte Insel im Abwehrkampf der Jahrhunderte.** [Malta. Unconquered isle in the centuries of defensive war.] *Die Erde*, Berlin, No. 3/4:224–240, **1953.** 2 figs. **DWB, DLC**—The unusual features of the climate of Malta are pointed out and illustrated graphically on p. 227–228 of this article. The days are uniformly hot and humid and the nights are also warm and humid. The summers are very dry and the winters wet and sometimes stormy, snow is rare and ephemeral. A notable rise in temperature is noted in the averages for every month of the year between 1901–16 and 1941–50. In the same period the humidity has increased notably and the rainfall decreased in the first half of the year and increased in the autumn (compared with 1841–55). *Subject Headings:* **1. Climate of Malta 2. Climatic variations 3. Malta.**—*M.R.*

6.6–295 551.582.2(784)

*Bavendick, Frank J., **Climate and weather in North Dakota.** Bismarck, N. Dakota, State Water Conservation Commission, **1952.** 126 p. numerous figs., tables. Price: $1.00. **DLC**—A nicely compiled and printed bulletin giving the essential information about the climate and weather events of the past 80 years for North Dakota and particularly for Bismarck, N. Dakota, which is considered a representative station (with more available data than for any other station in the state). Besides the usual tabulations of precipitation and temperature and frost data for 40 cooperative stations, there are a number of interesting descriptions of auroras, blizzards, dust storms, droughts, clouds, waves, frost penetration, floods, prairie fires, tornadoes, ice storms and statistics on evaporation, hail, dry periods, snowfall, winds, fog, and other unusual weather events (arranged chronologically). In addition there are data on the levels of Devil's Lake, showing marked depletion of water storage from 1900–1940, and an equally marked rise in water level since 1940. This parallels the trend in precipitation and an inverse relationship to temperature trend since 1900. The

work contains many maps, charts, diagrams, wind roses. *Subject Headings:* **1. Climate of North Dakota 2. Climatic data 3. North Dakota.**—*M.R.*

6.6–296 551.582.2(74)

Hiatt, William E. (*Hydrologic Services Div., U. S. Weather Bureau*), **Basic data collection and related research of the Hydrologic Services Division of Weather Bureau.** (In: Pennsylvania Electric Assoc. Hydraulics Power Committee, **Symposium on climatic trends in Northeastern United States, April 22–23, 1952, Minutes. 1952.** p. 23–30. Discussion, p. 31–35. figs., table.) **DWB**—An inventory of climatic data, similar to the one for the Arkansas, White and Red River Basins, has been prepared for the New England Area by the Central Office of the U. S. Weather Bureau, and is soon to be published. Type of records and details are described and illustrated. In addition to source and length of record, a discussion of the climate of the area, including areal patterns of precipitation, run-off and evapotranspiration, and isohyetal charts (topographically adjusted) using period 1930–49, and upper limits of precipitation are analyzed for 3 areas: Maine; Connecticut and Coastal, Hudson and St. Lawrence drainage areas. *Subject Headings:* **1. Climatic data inventories 2. Data collection services 3. Climate of New England 4. New England. I. U. S. Weather Bureau.** —*M.R.*

6.6–297 551.582.2(777)

*Iowa. Dept. of Agriculture and U. S. Weather Bureau, Des Moines, Iowa, **Climatological summary, Waterloo, Iowa. 1951.** 35 p. mostly tables. Port. and biog. data on Ralph B. Slippy. **DWB**—An unusually complete summarization of data from a Cooperative Weather Station which was maintained at Waterloo, Iowa, from 1895 to 1950 without interruption by only two observers: M. L. Newton, a civil engineer (1895–1911) and his son-in-law Ralph B. Slippy (engineer and later mayor of Waterloo) from 1911–1949, inclusive. This is one of the longest and best records in the state. A brief historical and climatic summary is followed by usual tabulation of averages for month and year of temperature, precipitation and cloudiness parameters, values for each month and year of record, record maximum and minimum for each day of year, monthly and regional degree days for entire record, snowfall for each month of record and freeze data for each spring and fall for 3 criteria of freeze, probability of frost, etc. *Subject Headings:* **1. Climate of Waterloo, Iowa 2. Climatic data 3. Waterloo, Iowa. I. Slippy, Ralph B. II. Newton, M. L. III. Magnuson, M. D.**—*M.R.*

6.6–298 551.582.2(567)

*Iraq. Meteorological Service, **[Climatic charts.]** Baghdad, Survey Press, [1953?] colored charts (some fold.). Legends in English. Contents: **Mean daily relative humidity percent, Jan.–June; Mean daily pressure in millibars at M.S.L., May–Dec.; Mean daily maximum temperature in degrees °F., May–Dec.; Mean daily temperature (max+min.)/2 in °F., May–Dec. DWB**—Base map shows topography and details of settlements, etc. Isolines are in red for 4% R.H. (<18% in Aug. and Sept. in the interior to >82% in NE and along Persian Gulf in Jan.), pressure to 2 mb and temperature to 4°F (mean max. >110°F in interior in July and Aug. and mean >98° in SE). *Subject Headings:* **1. Climatic charts 2. Climate of Iraq 3. Iraq.**—*M.R.*

6.6–299 551.582.2(795)

***Ruth, Robert H. (*comp.*), **Cascade Head climatological data, 1936 to 1952.** Portland, Oregon, U. S. Dept. of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station, Jan. **1954.** 29 p. mostly tables (24). **DWB**—Comparative climatological data are given for period 1936–1952 (with some missing months as listed on p. 29) for 3 coastal stations in the Cascade Head Experimental Forest of Western Oregon. The Three Rox station is on the Pacific Ocean beach, Headquarters Station is 4.5 mi. from coast and Neskowin Creek Camp 5.7 mi. inland. Marine influences, effect of forests in intercepting rainfall, and fog drip are discussed in text. Tables give the usual monthly and annual temperature (mean and extreme), rainfall and frost (and growing season) data and in addition cloudiness and sunshine data. Precipitation increases rapidly toward interior (129″ at

Teskowin Creek), and on beach there are some winters without freezing temperatures. *Subject Headings:* **1. Climatic data 2. Climate of Oregon Coast 7. Cascade Head Forest, Ore.**—*M.R.*

CLIMATIC CHANGES

See also: **Influence of climatic variations on fish** (Malone), 6.6–317.

6.6–300 551.583:551.585.55

*Zawadil, Rudolf, **Zur Versteppungtendenz des Marchfeldes.** [The transformation of Marchfeld into a steppe.] *Wetter und Leben*, Vienna, 5(5/7):109–120, Aug. **1953.** 5 figs., 4 tables, 5 refs. **MH-BH**—A detailed analysis of the precipitation amount, precipitation days and precipitation intensity over a 70-year period, of temperature over a 90-year period, of cloudiness and sunshine duration in the Marchfeld region and in Vienna and a consideration of runoff and ground water level of vegetation of the Marchfeld is presented. It is shown that the climate of Marchfeld has been changing during the past 30 years; this change is marked by a tendency to greater continentality, dry, warm springs and summers and increasing aridity. *Subject Headings:* **1. Climatic variations 2. Climatic analysis 3. Climate of Marchfeld, Austria 4. Steppe climates 5. Marchfeld, Austria.**—*I.L.D.*

6.6–301 551.583.13:551.524.32:551.525(426)

Lawrence, E. N., **Singularities in the annual variation of air, grass and soil temperatures.** *Meteorological Magazine*, London, 83(986):235–241, Aug. **1954.** 5 figs., table, 8 refs., 3 eqs. **DWB**—Graphs of weekly values of mean daily grass minimum temperature, Jan. 1 to June 3, 1921–50, number of frosts per week, soil temperature at 4 and 8 in. and soil moisture deficit, at Rothamsted, show in early March a gradual decrease followed by a sharp rise in temperature associated with an anticyclonic maximum. Differences between mean screen and ground temperatures at several stations in E. England show a marked rise. Other minor singularities related to soil moisture are discussed. *Subject Headings:* **1. Temperature singularities 2. England.**—*C.E.P.B.*

6.6–302 551.583.13(435.2)

Maerks, H., **Die Abgrenzung und Kennzeichnung der Jahreszeiten nach meteorologischen und phänologischen Daten.** [The limits and character of the seasons from meteorological and phenological dates.] *Meteorologische Rundschau*, 7(7/8):140–145, July/Aug. **1954.** fig., 5 tables, 4 refs. **DWB**—Five-day averages (1914–1953) of temperature, sunshine, rainfall and rain days at Oldenburg are used to define 19 subseasons (grouped into: spring 12.3–4.6, summer 5.6–17.9, fall 18.9–26.11 and winter 27.11–11.3). Meteorological and phenological characteristics of each are tabulated and dates compared with S. Germany. *Subject Headings:* **1. Seasonal variations 2. Phenology 3. Oldenburg, Germany.**—*C.E.P.B.*

6.6–303 551.583.13:551.521

Wexler, Harry, **Climatic fluctuation and the solar cycle.** *Weather*, 9(12):379–380, Dec. **1954. DWB**—Summary of author's talk in London on Oct. 12, 1954. Effect of 11-year sunspot cycle is similar to that of annual cycle of radiation. Upward trend of temperature is attributed to greater transparency as the atmosphere cleared after the volcanic eruptions of 1883, 1900 and 1912. *Subject Headings:* **1. Weather cycles 2. Sunspot cycle effects 3. Radiation variations.**—*C.E.P.B.*

6.6–304 551.583.14

Are winters getting warmer? *U. S. News and World Report*, Wash., D. C., 36(2):37–39, Jan. 8, **1954.** diagr., photo. **DLC**—Numerous bits of evidence that winters are getting warmer are listed and illustrated on a map of the U. S. The eastern and southern part of the U. S. averaged from +5° to +8° warmer during 1949–53 than during the 50-year period just passed. The opinions of various experts are cited; some think a permanent warming up is in process whereas others think the trend has or will reverse itself during the present generation. *Subject Headings:* **1. Climatic trends 2. Warming of Arctic.**—*M.R.*

6.6–305 551.583.14(410)

Glasspoole, J., **Recent seasonal climatic trends over Great Britain.** *Meteorological Magazine*, London, 84(992):33–38, Feb. **1955.** 4 figs., 2 refs. **DWB**—Ten year moving averages for seasons and year for England (with Wales) and Scotland are plotted for temperature (1901–54), sunshine (1905–54) and rainfall (1871–1954). The main features of the general trends are discussed. *Subject Headings:* **1. Climatic trends 2. Great Britain.**—*C.E.P.B.*

6.6–306 91.04(82) 551.583.3:551.311.12

Auer, Väinö, **Suomalainen tutkimus Tulimaassa ja Patagoniassa.** [Finnish research in Tierra del Fuego and Patagonia.] *Terra*, Helsinki, 66(1):1–21, **1954.** 14 figs. English summary p. 19–21. **DLC**—A description (accompanied by charts showing routes of expeditions) of Finnish glaciological, botanical and geological expeditions to Patagonia and Tierra del Fuego in 1928, 1937–38 and 1946 53. The writer led 13 expeditions to Fuego-Patagonia. Three volumes of the scientific results are being published in addition to 4 already published. From forest succession studies the fact that an arid period followed the Ice Age was established —subsequent changes are noted. Pollen analysis is also complete and informative. Conclusion is that changes in climate have been similar and simultaneous over the whole globe and that the Ice Age occurred at the same time in both hemispheres. *Subject Headings:* **1. Forest succession 2. Pollen analysis 3. Glacial investigations 4. Expedition reports 5. Climatic changes 6. Ice Age 7. Tierra del Fuego 8. Patagonia.**—*M.R.*

6.6–307 551.583.3

Manley, Gordon, **Changes in world glaciation.** *Nature*, London, 173(4417):1206–1208, June 26, **1954.** 9 refs. **DWB**—Report of discussion of Royal Astronomical Society and British Glaciological Society on Jan. 29, 1954. F. E. ZEUNER set out the complexity of the problem, including the effect of fluctuations of sea level, and the need for more facts. J. D. H. WISEMAN described work on deep sea sediment cores in relation to climatic oscillations and their dating. G. MANLEY also discussed minor fluctuations and suggested that minor Late Glacial readvances were due to falls of temperature of the same order as those causing maximum glaciations but lasting only 50–100 years. F. HOYLE thought variations of interstellar matter between sun and earth were important through their effect on the numbers of condensation nuclei. *Subject Headings:* **1. Glacial periods. I. Zeuner, F. E. II. Wiseman, J. D. H. III. Hoyle, F.**—*C.E.P.B.*

6.6–308 551.583.3:551.311.2(64)

Mensching, Horst and Raynal, René, **Fussflächen in Marokko. Beobachtungen zu ihrer Morphogenese an der Ostseite des Mittleren Atlas.** [Foothills in Morocco. Observations on their morphogenesis on the east of the Middle Atlas.] *Petermanns Geographische Mitteilungen*, 98(3):171–176, **1954.** 11 figs., refs. French summary p. 175–176. **DLC**—This study describes the land forms resulting from the great variety of rocks and climates. During the Quaternary each pluvial period formed a terrace, which was cut through in the following interpluvial. *Subject Headings:* **1. Pluvial periods 2. Land forms 3. Morocco.**—*C.E.P.B.*

6.6–309 551.583.3:551.521.7

Menzel, Donald H. (*Harvard Univ.*), **On the causes of the ice ages.** (In: Shapley, Harlow (*ed.*), **Climatic change.** Cambridge, Harvard Univ. Press, **1953.** p. 117–121. 6 refs.) **DLC**—Climatic changes may be associated not only with variations in solar radiation but also with corpuscular radiation from the sun, which may influence day-to-day weather. It is suggested that an incoming ion stream carries with it an energy density only over the limited area along a parallel of magnetic latitude roughly equivalent to that of solar radiation itself and that the atmosphere may be heated intensely and may change chemically in the ozonosphere. It is suggested that volcanic activity by producing sufficient quantity of particles provides condensation nuclei for cloud formation and precipitation and is associated with the ice ages. *Subject Headings:* **1. Ice Ages 2. Climatic changes 3. Corpuscular radiation 4. Solar influences.**—*I.L.D.*

6.6–310 551.583.3:551.521.1

Wollbach, John (*Harvard Univ.*), **The insufficiency of geographical causes of climatic change.** (In: Shapley, Harlow (*ed.*), **Climatic change.** Cambridge, Harvard Univ. Press, **1953.** p. 107–116. 10 refs.) **DLC**—C. E. P. Brooks' hypothesis that climatic conditions and changes such as the Ice Ages are the result of geographical condition is summarized. The inadequacy of purely geographical hypothesis in accounting for the Permian tropical glaciation necessitates the assumption of general refrigeration; but the recurrence of glacial and interglacial periods within the Ice Age requires a variation in the solar radiation reaching the earth either from an intrinsic change in the solar radiation or from the loss of solar radiation to the earth through reflection by dust particles in the upper atmosphere. The evidence for solar variation throughout geological time as revealed by the study of varves is summarized. *Subject Headings:* **1. Climatic changes 2. Solar radiation 3. Ice Age.**—*I.L.D.*

6.6–311 551.583.7:523.7

Bhatnagar, P. L. (*Harvard Univ.*), **Internal constitution of the sun and climatic changes.** (In: Shapley, Harlow (*ed.*), **Climatic change.** Cambridge, Harvard Univ. Press, **1953.** p. 137–142. 4 refs., 16 eqs.) **DLC**—The author presents E. J. Öpik's attempt at explaining the temporary variations in the luminosity of a star on the basis of sudden (within a time scale of 10^9 years) changes in the structure of a star. It is based upon a stellar model consisting of "(1) a central convective core with polytropic index 1.5 in which the energy transport is partly by convection and partly by radiation; (2) an intermediate radiative shell in which radiation alone transfers the energy from point to point, and (3) a peripheral convective region with polytropic index 1.2." Convective disturbances in the metastable layer, the replacement of radiative equilibrium by convective equilibrium and the resulting effect upon the luminosity provide a situation in which an initially cool sun which gradually becomes warmer and which is at some stage between the cool and the hot sun when the formation of ice exceeds its melting. *Subject Headings:* **1. Climatic changes 2. Stellar models 3. Paleoclimates 4. Solar influences.**—*I.L.D.*

MICROCLIMATOLOGY

See: **Influence of earth's surface on atmos.** (Businger), 6.6–14; **Plant climate** (Searle), 6.6–83.

CLIMATIC CLASSIFICATION

See: **Water supply in arid areas,** 6.6–290; **Transformation of Marchfeld into steppe** (Zawadie), 6.6–300; **New geographical characteristics, U.S.S.R.** (Grigor'ev), 6.6–321.

BIOCLIMATOLOGY

See also: **Temp. measurem. of paddy field** (Satone), 6.6–90.

6.6–312 551.586:612:91.04

Pugh, L. G. C. E., **Scientific problems on Mount Everest, 1953.** *Himalayan Journal*, Oxford, 18:46–58, **1954. DLC**—This broadcast talk dealt first with protective equipment against cold, great variations of temperature (sun temperature at 20,000 ft reached 165°F) and strong winds. Clothing is described in detail. Pt. 2 discussed rations and Pt. 3 the use of oxygen apparatus. *Subject Headings:* **1. Physiological climatology 2. Mount Everest expeditions 3. Mt. Everest, Himalayas.**—*C.E.P.B.*

6.6–313 551.586:136

Orechia Buro, Helido Antonio, **Clima y psicología.** [Climate and psychology.] *Revista Orientación Meteorológica*, Montevideo, No. 7:31–33, June **1954. MH-BH**—The general problems of climato-psychology are outlined. The effect of weather factors on the human psyche can be direct or indirect (acting through an intermediate physiological effect). General examples of such effects are mentioned. *Subject Headings:* **1. Psychology 2. Bioclimatology.** —*G.T.*

6.6–314 551.586:636

Fedoseev, A. P., **Meteorologiia i otgonno-pastbishchnoe zhivotnovodstvo.** [Meteorology and livestock pasturing.] *Priroda*, Moscow, 9:99–102, Sept. **1952.** 4 illus. **DLC**—A description of the establishment of a special meteorological service for the livestock industry of Kazakhstan. Since 1946 a network of hydrometeorological stations has been established. In addition to providing information on the water regime and the usual meteorological observations, special observations on soil moisture and condition of vegetation and 8–10 day forecasts for particular pasturing areas are provided. Cooperative observers participate in the collection of data. *Subject Headings:* **1. Animal climatology 2. Pastures 3. Kazakhstan, U.S.S.R.**—*I.L.D.*

6.6–315 551.586:636.2:628.8

Nelson, G. L. and Berousek, E. R., **Dairy cattle loafing barns designed for summer temperature control.** *Agricultural Engineering*, 33(5):290-292, May **1952.** 7 figs., 5 refs. **DLC**—Report on the experiments started in 1950 at the Oklahoma Agricultural Experiment Station, Stillwater, with a view toward obtaining data on the effect of temperature-controlled shelters on the performance of dairy cattle. It is pointed out that no evidence of such an effect could be obtained in the first summer, which was a particularly cool one. Construction of two experimental shelters and conditions prevailing in them are described in detail. A map of the U. S. based on 5-year records of U. S. Weather Bureau and showing number of hours with dry bulb temperature above 85°F is reproduced from *Heating and Ventilating*, March 1939, p. 36. *Subject Headings:* **1. Animal climatology 2. Temperature effects 3. Temperature control.**—*G.T.*

6.6–316 551.586:636.2

Simonett, David S. (*Dept. of Geog., Sydney Univ.*), **Climate and cattle production in North Australia (Cairns-Normanton).** *Australian Geographer*, 6(2):15 24, March **1953.** 2 figs., 4 tables, 9 refs. **DWB**—Cattle production in the 40,000 sq-mi Cairns-Normanton region is closely correlated with the monsoonal climate of that area. Amount of effective rainfall, length of the wet season, length of the dry season and frosts are factors which directly or indirectly influence pasture growth, calving rates, cattle mortality, herd maintenance and supplementary grain and forage production. General data showing the distribution of these factors at various stations throughout the area are presented and discussed. *Subject Headings:* **1. Animal climatology 2. Australia.**—*G.T.*

6.6–317 551.586:639.2:551.583

†Halme, Erkki (*Dir. Bureau of Fishery Investigations, Finland*), **On the influence of climatic variations on fish and fishery.** *Fennia*, Helsinki, No. 75:89–96, **1952.** foot-refs. **DWB**—Literature review on the variations in the catch of fishes, observed for up to 1000 years (herring on the Swedish west coast). Some Finnish papers are discussed in more detail, as well as reports on the catch of fish in the Arctic. The connection with the climatic environment is not quite understood, since many factors are involved (food, sensitivity to temperature and salinity, breeding conditions, etc.) *Subject Headings:* **1. Ecoclimatology 2. Fishing 3. Climatic variations 4. Baltic Sea 5. North Atlantic.**—*A.A.*

6.6–318 551.586:646

Belding, Harwood S., **Protection against dry cold.** *U. S. Quartermaster Corps. Research and Development Branch, Environmental Protection Section, Report* No. 155, Aug. 2, **1949.** 19 p. 7 figs., 2 tables, refs., 7 eqs. **MH-BH**—A comprehensive and moderately technical discussion of the personal (metabolic rate and durations of exposure) and environmental (temperature, wind speed, altitude) factors influencing man's needs for protection against dry cold. The methods used for evaluating the thermal insulation provided by clothing and the factors influencing the thermal insulation properties of clothing. The equations for calculating insulation are presented and insulation is calculated for exposure of specified duration for various wind speeds, for particular ambient temperature and for various altitudes. *Subject Headings:* **1. Clothing climate 2. Clothing requirements 3. Clothing insulation.**—*I.L.D.*

6.6–319 551.586:646

Herrington, L. P. (*Yale Univ., Dept. of Public Health*), **Clothing and climate from a physiological point of view.** (Paper presented, Nov. 6, 1952 at the 1952 Annual Convention, of the American Association of Textile Chemists and Colorists.) *American Dyestuff Reporter*, N. Y., 42:62–69, Feb. 2, **1953.** 3 tables, 5 refs. Abstracted from photostat. **DWB**—The author discusses the physiological basis of thermal regulation in man, the effect of environmental temperature upon the biological cost of living of animals, the insulating role of clothing, experimental methods of testing, the insulating value of clothing involving the concepts of clo and tog, the use of infrared reflecting materials as insulation in clothing and the insulating value of fibers of various grades of moisture-regain capacity. *Subject Headings:* **1. Physiological climatology 2. Clothing climate.**—*I.L.D.*

6.6–320 551.586:796.52:551.585.7

Shipton, Eric, **The expedition to Cho Oyu.** *Geographical Journal*, 119(2):129–139, June **1953.** photos. Discussion p. 137–139. **DWB**—This paper on an expedition in the Himalayas is of bioclimatological interest for an account by Dr. Pugh of physiological questions connected with climbing of Mount Everest—low temperature, effect of high winds, and lack of oxygen, including the best form of apparatus to use. *Subject Headings:* **1. Bioclimatology 2. Mountaineering.**—*C.E.P.B.*

ENVIRONMENTAL INFLUENCES

See also: **Climatic change** (Dzerdzeevskii), 6.6–126; **Flow conditions in mountain land** (Kaiser), **6.6–241.**

6.6–321 551.588.7:551.585.5

Grigor'ev, A. A., **Novye cherty v geografii nasheĭ strany, sozdavaemye velikimi stroĭkami kommunizma.** [New characteristics in the geography of our country established by the great constructions of communism.] *Akademiia Nauk, SSSR, Izvestiia, Ser. Geograficheskaia*, No. 2:3–10, **1952. DLC**—This is a review and enumeration of completed works, unfinished and only projected measures undertaken by the Soviet Government since 1924 in land reclamation and climatic amelioration of the forest steppe, steppe and arid zones of the Soviet South and drought control. The author points out the importance of such works as: forest shelter belts, new irrigation and water supply, measures for retention of rain and snow melt waters, reduction of surface discharge, creation of systems of ponds and other water reservoirs, introduction of grass land agriculture, complete afforestation of sandy and waste lands, construction of canals (many already completed), utilization of river resources for hydro-electric power plants, etc. *Subject Headings:* **1. Climatic amelioration 2. Steppes 3. Arid zones 4. Shelter belts 5. Irrigation 6. U.S.S.R.**—*A.M.P.*

SYNOPTIC CLIMATOLOGY

See also: **Mecklenburg in winter** (Knepple), 6.6–275.

6.6–322 551.589.5

*Gilbert, J.; Goyer, G. and Lambert, J. (*Paris*), **Fréquence de l'air froid et des gradients suradiabatiques dans les basses couches à l'ile Amsterdam.** [Cold air and superadiabatic gradient frequencies in the lower layers over Amsterdam Island.] *Journal Scientifique de la Météorologie*, Paris, 5(19):116–126, July/Sept. **1953.** fig., 9 tables, 4 refs. French, English and Spanish summaries p. 102. **DWB**—Temperature gradients over the sea and land and vertical wind speeds are analyzed for Amsterdam Island (S. Central Indian Ocean, $\phi = 38°S$), mostly on the basis of 1951 radiosondes made there, and the conclusion is reached that cold air from the Antarctic overlies the island most of the year (April–Dec.). Conditions at Amsterdam Island are compared month by month and level by level with those at Lajes do Pico, Azores for 1951 (1000 to 40 mb). The lower stratosphere is colder at Lajes than at Amsterdam Island at all seasons. *Subject Headings:* **1. Upper air climatology 2. Air mass frequencies 3. Vertical velocities 4. Amsterdam Island 5. Lages do Pico, Azores.**—*M.R.*

MISCELLANEOUS

SOLAR INFLUENCES AND VISIBILITY

See also: **Visibility** (Berezkin), 6.6–15; **Visibility studies** (U.S.W.B.), 6.6–16.

6.6–323 551.590.24:523.78

[Banerjee, S. S.?], **The solar eclipse of June 30, 1954.** *Science and Culture*, Calcutta, 20(1):2–3, 34, July **1954.** **DWB**—Observations made at Phalodi, India (70 mi NW of Jodhpur) during the 1 min 8 sec of totality and for several days before and after the eclipse of June 30, 1954, are described. These include solar, ionospheric, radio noise, geomagnetic, eye, atmospheric electric potential gradient and conductivity and ordinary meteorological observations at the surface and in the upper atmosphere by means of special and normal radiosondes. *Subject Headings:* **1. Solar eclipse, June, 1954 2. Eclipse observations 3. Phalodi, India.**—*M.R.*

6.6–324 551.591.361

Markgraf, Hans, **Aussergewöhnliche Feuersichtung auf deutschen Feuerschiffen.** [Unusual visibility of lights on German lightships.] *Wetterlotse*, 82:8–15, Jan. **1955.** fig., table. **DLC**—On night of Sept. 14–15, 1952, lights were visible up to 81 naut mi from a lightship. Abnormal visibility also occurred on Oct. 4–6, 1953 and May 12, 1954. All were in modified polar air warmed and dried by subsidence, beneath much warmer air. Just below the inversion, at 1–3 km height, was a sheet of haze or cloud. *Subject Headings:* **1. Exceptional visibility 2. German lightships.**—*C.E.P.B.*

OPTICAL PHENOMENA

See also: **Twilight sky brightness** (Ashburn), 6.6–199; **Afterglow** (Pillow), 6.6–219.

6.6–325 551.593.51

Green sun and moon. *Marine Observer*, 25(167):37, Jan. **1955.** **MH-BH**—Jan. 24, 1954, in 64°S, 80°E, green sun at sunrise. Same day in 39°37′N, 157°18′W, remarkable observation of green moon with green corona. Both phenomena may have been due to volcanic dust or smoke from forest fires. *Subject Headings:* **1. Green sun 2. Green moon.**—*C.E.P.B.*

6.6–326 551.593.62:551.574.41

Monteith, J. L., **Refraction and the spider.** *Weather*, 9(5):140–141, May **1954.** figs., ref. **DWB**—An arc of light, tinged with red, was seen on the grass in Middlesex at night, caused by the light from a nearby 100-watt bulb shining on a dense veil of gossamer covered with small drops of about 0.05 mm diameter. It is explained by the theory of the rainbow. *Subject Heading:* **1. Horizontal rainbows.**—*C.E.P.B.*

6.6–327 551.593.62(09)

Munn, R. E., **Early theories on the nature of rainbows.** *Weather*, 10(2):52–55, Feb. **1955.** 5 refs. **DWB**—Theory of rainbows is traced through speculations of ARISTOTLE, experiments of ROGER BACON (born 1214) who came near correct explanation but was disregarded, DESCARTES, etc. and finally NEWTON (1672). *Subject Headings:* **1. Rainbows 2. History of meteorology.**—*C.E.P.B.*

6.6–328 551.593.63

Halos. Atlantic Equatorial waters. Red Sea. North Atlantic Ocean. Mozambique Channel. *Marine Observer*, 25(167):35–37, Jan. **1955.** 2 figs. **MH-BH**—Jan. 25, 1954, in 5°12′S, 34°40′W and March 25, 1954, in 13°36′N, 43°E, solar halos with exceptionally clear colors, including blue and violet. Jan. 15, in 26°30′N, 42°23′W, lunar halo with cross. Feb. 17, in 61°N, 15°20′W, extensive halo complex including white anthelion and 4 parhelia (sketch). Feb. 12, 1954, 13°20′S, 44°21′E, lunar halo of radius 15°. *Subject Heading:* **1. Halos.**—*C.E.P.B.*

6.6–329 551.593.7

Dumont, René, **Mesures de la dispersion du degré de polarisation au zénith entre 4 000 et 8 500 Å.** [Measurement of the scatter of degree of polarization at the zenith between 4000 and 8500 Å.] *Académie des Sciences, Paris, Comptes Rendus,* 238(26):2512–2514, June 28, **1954.** fig., 4 refs. **DWB**—Canalized spectra were measured with a special photometric calibration technique. The variation of polarized light as a function of wavelength is strongly affected by the height of the sun. Multiple diffusion, diffusion by the soil surface and absorption by haze have to be taken into consideration in evaluating the measurements. *Subject Heading:* **1. Polarization.**—*Trans. of author's abstract.*

6.6–330 551.593.7:551.521.14

Lange, Otto, **Die Polarisationsgrösse p in ihrer Abhängigkeit von Instrumentenhöhe und Albedo.** [The dependence of polarization magnitude p on instrument height and albedo.] *Zeitschrift für Meteorologie,* 8(4):97–111, April **1954.** 11 figs., 7 tables, 10 refs., 13 eqs. **MH-BH**—After establishing the approximation formula for the variability of the polarization value p, the integral functions F_1 and F_2, which are dependent upon the earth's atmospheric pressure H_e for certain H_e means, were computed, the air pressure at the place of observation being $H_b = 760$ mm Hg. The constants which were not indicated but occurred in F_1 and F_2 were determined graphically. The change of p with H_e, i.e., stationary height of the polarimeter over the earth's surface Z_o, is minor at limited instrument height and should be disregarded. To formulate this change as well as that of the arguments of sun height α and sun distance ϕ, albedo of the earth's surface μ and pressure at the place of observation is rather complicated. For the maximum polarization, ϕ is the constant, for the zenithal polarization, a function of α, so that p in the first case does not change with ϕ and in the second case under the consideration of $\alpha = 90° - \phi$ these changes coincide completely. The variability of polarization value with α and μ has been tabulated while those of the H_b will be computed at a later date. *Subject Headings:* **1. Polarization 2. Albedo 3. Instrument exposure.**—*Transl. from author's abstract.*

ELECTRICAL PHENOMENA

See also: **Negative ions** (Massey), 6.6–3; **Sferics** (Isikawa, Takagi), 6.6–3; **Radio noise** (Minkowski, Greenstein), 6.6–210; **Electrified particles** (Blanchard), 6.6–259.

6.6–331 551.594:523.78

Rouch, Jules, **Observations du champ électrique de l'atmosphère, faites à Monaco pendant l'éclipse partielle du soleil du 20 juin 1954.** [Measurements of the atmospheric electric field at Monaco during the partial eclipse of the sun, June 20, 1954.] *Académie des Sciences, Paris, Comptes Rendus,* 239(6):465–466, Aug. 9, **1954. DWB**—The atmospheric electric field intensity shows a marked maximum following the climax of a partial eclipse, Monaco, June 20, 1954. *Subject Headings:* **1. Atmospheric electricity 2. Solar eclipses 3. Monaco.**—*G.T.*

6.6–332 551.594.1:551.575

Reiter, Reinhold, **Zeitliche Verlauf von Vertikalstrom, luftelektrischem Feld und Luftleitfähigkeit während Nebel auf der Zugspitze und auf dem Zugspitzplatt.** [Time variation of vertical current, electric field and conductivity during fog on the Zugspitze and the Zugspitze plateau.] *Meteorologische Rundschau,* 7(11/12):212–213, Nov./Dec. **1954.** 2 figs., table, 6 refs. **MH-BH**—Records at Zugspitze peak (2963 m) and plateau (2500 m) on 3 days of fog are shown and compared with normal values in radiation weather. There is considerable variation, the causes of which are discussed. Drifting fog usually has little effect. Some other cases are also considered. *Subject Headings:* **1. Atmospheric electricity in fog 2. Zugspitze, Germany.**—*C.E.P.B.*

6.6–333 551.594.12:537.52

Chalmers, J. Alan and Mapleson, W. W., **Point discharge currents from a captive balloon.** *Journal of Atmospheric and Terrestrial Physics,* 6(2/3):149–159, March **1955.** 3 figs., 15 refs., 10 eqs. **DWB**—Measurements from photographic records of discharge from a point (or

group of 8 points) on upper neck of a balloon were made at heights of 50–200 m. Theory of point discharge is set out and partially checked against observations. Total current varied with voltage Fh at point and wind W giving

$$I = 0.021\,(Fh)^{1.77}\ W^{0.23},\ W \text{ in km/hr.}$$

Subject Heading: **1. Point discharges.**—*C.E.P.B.*

6.6–334 551.594.221

Hodges, D. B., **A comparison of the rates of change of current in the step and return processes of lightning flashes.** *Physical Society of London, Proceedings, Ser. B*, 67(7):582-584, July 1, **1954.** 2 figs., 5 refs., eqs. **DWB**—Ratio of amplitudes $\bar{p}$ of radiation fields of stepped leader ripple to return streamer P at Johannesburg were found for leaders of type α (persistent fairly uniform pulsations) and β (initial large ripple). $P/\bar{p}$ was 10–40 (mode 15) for α and 2 10 (mode 3.5) for β. From observed values of change of current in strikes it is calculated that surge of current in α type steps is about 620 amp and in β 2600 amp. *Subject Heading:* **1. Lightning.**—*C.E.P.B.*

6.6–335 551.594.222

Large, M. I. and Pierce, E. T., **The fine structure of natural point-discharge currents.** *Royal Meteorological Society, Quarterly Journal*, 81(347):92–95, Jan. **1955.** 6 figs., 6 refs., 3 eqs. **DWB**—Discharges from platinum points at 7 m connected to earth are shown to resemble point-to-plane discharges in the laboratory. When the point is a negative electrode the current consists of a series of regular pulses. When it is positive the discharge is more complex, "inductive kicks" associated with incipient streamers developing into a steady current. A number of records are shown. The effect of natural point-discharge currents on television is illustrated. *Subject Heading:* **1. Point discharges.**—*C.E.P.B.*

6.6–336 551.594.223(43)

Rodewald, Martin, **Kugelblitzbeobachtungen.** [Ball lightning observations.] *Zeitschrift für Meteorologie*, 8(1):27–29, Jan. **1954. MH-BH**—A description of an occurrence of ball lightning on the afternoon of May 7, 1950, in the Harburg district. In addition to the official report, the author cites description of the same event by five independent observers. *Subject Headings:* **1. Ball lightning 2. Harburg-Wilhelmsburg, Germany.**—*I.L.D.*

6.6–337 551.594.25:551.578.4

*Norinder, Harald and Siksna, Reinhards, **Experiments concerning electrification of snow.** *Arkiv för Geofysik*, 2(3):59-89, June 3, **1953.** 16 figs., 22 tables, 17 refs. **DWB**—In order to determine quantitatively the electrical properties of snow in motion, a device was constructed for measuring the charges and the resistivities of sugar, salt, freezing water and snow in various states of rest or motion. Sugar and salt have high resistivity compared with snow or freezing (super-cooled) water or ice. Snow poured into a funnel does not create problems that sugar does because snow has such a low resistivity and hence little residual charge. On the other hand special problems arose, such as loss of effectiveness of equipment due to clinging particles of snow which destroy the insulative properties of the funnels (if non-metallic) or bags (paper). Detailed data are presented in tables and graphs on experiments with pouring, casting, blowing and still snow at different temperatures. Charge in air was measured with ion-counters, and was found to be due, possibly, to tiny snow particles in air. *Subject Headings:* **1. Snow static 2. Snow resistivity 3. Electrification of snow.**—*M.R.*

6.6–338 551.594.25

Smith, L. G., **The electric charge of raindrops.** *Royal Meteorological Society, Quarterly Journal*, 81(347):23–47, Jan. **1955.** 19 figs., 3 tables, 16 refs., eqs. **DWB**—Apparatus is described for measuring the charge, mass and size of individual raindrops. Point-discharge current, field strength and rain current were also measured in an open field near Cambridge, England, when rainfall exceeded 1 mm/hr. A number of individual occasions are discussed. The charge on a particular size of drop in any rain period may be positive or negative, with a large range, but there is often a certain size for which the average charge is zero, being opposite to that of the field for smaller drops and of the same sign for larger drops. If the drops are

too small to be recorded, the field is usually reversed to a small value of −5 to −10 v/cm, attributed to the splashing of drops on the ground. The calculated results of the capture of ions by falling drops in the region of point discharge below an electrified cloud give a relation between charge and size of drops reaching the ground similar to that found experimentally, the range of charge being due to mixing of drops leaving the cloud base in regions of different current density. This implies that areas of cloud base of high current density do not exceed 100 m in diameter. *Subject Heading:* **1. Electricity of precipitation.**—*C.E.P.B.*

6.6–339 551.594.5:621.396.8

McNamara, A. G. and Currie, B. W., **Polarization of radio echoes from aurorae.** *Nature*, London, 174(4442):1153–1154, Dec. 18, **1954.** 3 figs., 6 refs. **DWB**—Observations at Saskatoon on 56 Mc/s are analyzed statistically for ratio (horizontal/vertical polarization) frequency variation as a function of range, showing a significant increase at 500–900 km, and echo occurrence against radar range. Some observations on 106.5 Mc/s are included; these showed only plane polarization in sense of transmitted signals. *Subject Heading:* **1. Radio echoes from auroras.**—*C.E.P.B.*

6.6–340 551.594.5:523.78

Paton, J., **An attempt to observe daytime aurora.** *British Astronomical Association, London, Journal*, 64(8):376–378, Oct. **1954. DWB**—Sky was scanned from an airplane flying east along central line of eclipse of June 30, 1954, with polaroid filters with transmission on 5577, 6300 and 4273 Å. No trace of aurora was seen. *Subject Heading:* **1. Solar eclipse aurora.**—*C.E.P.B.*

6.6–341 551.594.5

Paton, James and McInnes, Bennet, **List of auroral occurrences 1951–53.** *British Astronomical Association, London, Journal*, 64(8):393–395, Oct. **1954. DWB**—Nights when aurora were observed from places in and south of geomagnetic latitude 63° between geom. long. 70–90°. *Subject Heading:* **1. Auroras.**—*C.E.P.B.*

6.6–342 551.594.5

Sucksdorff, G. Eyvind, **Das Polarlicht.** [Aurora.] *Naturwissenschaftliche Rundschau*, 8(1):7–15, Jan. **1955.** 12 figs. **DWB**—A useful summary is given of existing knowledge of auroras. Charts show frequency distribution around N and S magnetic poles, and heights in dark and sunlit parts of the atmosphere. Rays extending to 1100 km have been photographed. Relations to earth's magnetic field and to solar activity are discussed. Aurora is attributed to particles from the sun travelling along magnetic lines of force. Various theories are summarized but all present difficulties. Forms of aurora are described and illustrated. *Subject Headings:* **1. Auroras 2. Auroral theories.**—*C.E.P.B.*

6.6–343 551.594.6:551.594.221

Koster, J. R. and Storey, L. R. O., **An attempt to observe whistling atmospherics near the magnetic equator.** *Nature*, London, 175(4444):36–37, Jan. 1, **1955.** 5 refs. **DWB**—According to the theory of T. H. Barkhausen and T. L. Eckersley whistlers are due to dispersion in the ionosphere of "clicks" radiated by lightning strokes, and should not occur near geomagnetic equator. At Achimota, Gold Coast, no whistlers were detected in 3 years (about 16 hours observation) though they occurred 1–3 times a minute during the same period in England. *Subject Headings:* **1. Radio noise 2. Sferics 3. Whistling atmospherics 4. Achimota, Gold Coast. I. Barkhausen, T. H. II. Eckersley, T. L.**—*C.E.P.B.*

6.6–344 551.594.7:523.58

Greenhow, J. S. and Neufeld, E. L., **The diffusion of ionized meteor trails in the upper atmosphere.** *Journal of Atmospheric and Terrestrial Physics*, 6(2/3):133–140, March **1955.** 7 figs., 2 tables, 13 refs., 4 eqs. **DWB**—Between 80 and 100 km, duration of radio echoes from meteor trails decreases nearly exponentially. Records on 8.27 and 4.35 m are shown and compared with theory. Log (diffusion coefficient) is plotted against height and after correction agrees well with theoretical curve. Approximate estimates of meteor heights may be made from echo durations. *Subject Heading:* **1. Radio echoes from meteor trails.**—*C.E.P.B.*

ACOUSTICAL PHENOMENA

See: **Acoustic wind measurem.** (Von dem Borne), 6.6–58.

GEOMAGNETISM, ASTROPHYSICS, ETC.

6.6–345 523.7:538.3

Dungey, J. W., **Solar electrodynamics.** *Journal of Atmospheric and Terrestrial Physics*, 6(2/3):88–90, March **1955.** 3 refs., 4 eqs. **DWB**—It is suggested that confusion in solar electrodynamics arises from the use of causal relationships borrowed from laboratory electrodynamics. A concept of "causality" is introduced which depends on the fundamental equations used, so that the causal relationships must be changed when approximations are made. This concept is used to discuss the reduction in conductivity by a magnetic field and the effect of a polarization electric field. *Subject Heading:* **1. Solar electrodynamics.**—*Author's abstract.*

6.6–346 523.74:63

*Fujiwhara, S., **Relations among "Omiwatari," sunspots and rich and poor harvests.** *Geophysical Magazine*, Tokyo, 26(1):1–17, Aug. **1954.** 3 figs., 3 plates, table. **DWB**—Statistical comparison of (a) years in which famines occurred in Japan (2000-year period), (b) freezing dates of Lake Suwa (500-year period) and (c) sunspot activity (200-year period). Some relation appears to exist between all three phenomena. *Subject Headings:* **1. Sunspot-crop yield relationships 2. Long period records 3. Japan.**—*G.T.*

6.6–347 532

Batchelor, G. K. (*Trinity College, Cambridge*), **Skin friction on infinite cylinders moving parallel to their length.** *Quarterly Journal of Mechanics and Applied Mathematics*, London, 7(2):179–192, June **1954.** 3 figs., 10 refs., eqs. **DWB**—The frictional force on a cylinder moving steadily parallel to its length through a viscous liquid which is initially at rest is determined with reasonable accuracy over the whole range of values of the duration of the motion and for a wide variety of shapes of the cylinder cross-section. When the time t is small, the first approximation gives a force per unit area which is the same as that for a flat plate of infinite width. The second approximation takes the shape of the cylinder into account and the force on unit length of the cylinder is the same, to this approximation, as that on a circular cylinder of the same perimeter. For large values of t the determination of the frictional force is reducible to that of a potential problem, the solution of which is known for a number of different shapes. The approximations for a small and large values of t for any one cylinder do not overlap but can be joined without much ambiguity. For no value of t do the forces on cylinders of different shape (excluding those whose curvature is not everywhere inwards) differ by more than about 25 percent. *Subject Heading:* **1. Fluid mechanics.**—*Author's abstract.*

6.6–348 535.32

Hineken, F. W. and Bruin, F. (*Zeeman Lab., Amsterdam Univ., Netherlands*), **Some measurements on refractive indices of gases in the microwave region.** *Physica*, Amsterdam, 20(6):350–360, June **1954.** 4 figs., 2 tables, 16 refs. **DWB, DLC**—A method is described to measure refractive indices of gases at atmospheric pressure and at a frequency of 25,000 Mc/s. The method is based on the change in resonance frequency of a cavity, first filled with a reference gas (nitrogen) and after that with the gas of which the refractive index is to be determined. However, instead of measuring the frequency change of a fixed cavity the authors measure the change in length of the cavity, necessary to keep it tuned in both cases to the frequency of the (6,6) inversion line of ammonia. Subsequently the reading with a nitrogen filling is compared to the one of the evacuated cavity, so that all refractive indices are obtained with respect to *vacuo*. Results of these measurements for ten gases are given. As the absorption is extremely small and the inaccuracy of measurements of refractive indices amounts to one or two parts in 10^6 for these gases, the introduction of a complex refractive index is found to be unnecessary. *Subject Headings:* **1. Refractive index 2. Gases.**—*Authors' abstract.*

6.6–349 535.33

Stone, H., **Effects of inert atmospheres on emission spectra in the interrupted arc.** *Optical Society of America, Journal,* 44(5):411–413, May **1954.** fig., 6 tables, 6 refs. **DLC**—A comparison of the spectra of several elements produced in the interrupted arc in helium, helium-oxygen mixtures, argon, and air has been made. It has found that the differences observed in the spectra are not uniform, but vary according to the ionization state of the spectral lines; those lines requiring large energies for excitation being more intense in a rare gas atmosphere than in air, and those lines requiring small energies for excitation being more intense in air than in a rare gas. It is shown that with the interrupted arc the use of rare gas atmospheres cannot lead, except in isolated cases, to an improvement in the sensitivity of emission spectrographic analysis. *Subject Heading:* **1. Emission spectra.**—*Author's abstract.*

6.6–350 538.566

†*Aden, Arthur L., **Back-scattering of electromagnetic waves from spheres and spherical shells.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* No. 15, July **1952.** 42 p. 21 figs., bibliog. p. 41–42, 5 eqs. **DWB**—In the introduction the author reviews some earlier work pertinent to the subject. The scope of this paper is to (1) evaluate the reflection from a single water sphere with particular attention to the back-scattering cross section, which is the main subject under discussion. The classical theory of scattering from a sphere is reviewed, the common absorption and scattering parameters defined, and a method to measure the back scattering from spheres briefly described. A method to facilitate the computations leading to numerical answers, by using logarithmic derivative functions in Infeld's recurrence formulas is exemplified by the evaluation of the back-scattering for water spheres at λ 16.230 cm in the size range form $0.6 < 2\pi a/\lambda < 6$. This method will give exact numerical answers for any order of the scattering amplitude coefficient, regardless of a complex index of refraction. Finally, the determination of the rigorous formal solution for the melting snow or ice particle is demonstrated by considering the reflection from two concentric spheres with different complex dielectric factors as a first approximation, then by using the method as for a single sphere. Comparison is made between the theoretical and experimental results. *Subject Headings:* **1. Electromagnetic waves 2. Radio communication.**—*W.N.*

6.6–351 550.37/38

Belluigi, A., **Sui "campi geoelettromagnetici normali" attivati da sistemi galvanico-induttivi e induttivi.** [On the "normal geoelectro-magnetic field" activated by galvano-inductive and inductive systems.] *Beiträge zur Geophysik,* 64(3):147–155, **1955.** 3 figs., 22 eqs. Italian and German summaries p. 147. **DWB**—A fundamental property of "normal geoelectromagnetic fields" (i.e., with uniform ground) is demonstrated, e.g., fields which are marked by electromagnetic-galvanic, inductive or mixed systems. This property permits among other things the determination of the geoelectromagnetic field by a uniform method. A closed quasistationary transmitter (coil or loop) is used, permitting an exact determination of the magnetic field, or an open transmitter, with which it is unimportant whether the electric or the magnetic field is considered, since the electric energy is of the same order of magnitude as the magnetic. *Subject Headings:* **1. Geoelectricity 2. Terrestrial magnetism.**—*Transl. of author's abstract.*

6.6–352 550.381

Keller, Fred, Jr.; Meuschke, J. L. and Alldredge, L. R., **Aeromagnetic surveys in the Aleutian, Marshall, and Bermuda Islands.** *American Geophysical Union, Transactions,* 35(4):558–572, Aug. **1954.** 12 figs., 15 refs. **MH-BH**—Total-intensity aeromagnetic surveys of the Aleutian, Marshall, and Bermuda Islands were completed in 1948. The anomalies associated with the Aleutian volcanoes are attributed mainly to topographic relief and are not an indication of the degree of volcanic activity. Eniwetok presents a magnetic pattern that would be produced by an irregular-shaped rimmed depression in the basement, modified by the two adjoining seamounts, and differs from Bikini, whose magnetic features would be produced by a broad seamount with irregular surface relief. The Bermuda survey demonstrated magnetic features typical of volcanic rocks. The Aleutian Trench survey shows anomalies that are attributed to susceptibility contracts but may be indications of uncharted

seamounts. Two traverses, one from Cape May, N. J., to Bermuda and the other from Bermuda to Long Island, N. Y., reveal a change in the magnetic field approximately 300 miles from the Atlantic Coast that indicates a possible thinning of the sial and an exposure of sima. *Subject Headings:* **1. Aeromagnetic surveys 2. Magnetic anomalics 3. Aleutian Islands 4. Marshall Islands 5. Bermuda.**—*Authors' abstract*

6.6–353 550.385

Junge, Christof, **Bai-Untersuchungen am Geophysikalischen Observatorium Collm.** [Bay-investigations at the Geophysical Observatory of Collm.] *Beiträge zur Geophysik*, 64(3):173-193, **1955.** 12 figs., 13 refs. **DWB**—Records at Leipzig Collm Observatory 1935–1945 were examined for bay disturbances. Four types were distinguished: simple positive or negative; double wave; modified bay, positive or negative; and bay composed of primary waves. The second and fourth are termed "mixed bays." Annual and diurnal variations are analyzed. The horizontal disturbance vector rotates counter-clockwise once a day. Repetition tendency is examined. Disturbances at neighboring observatories of Collm and Niemegk are compared. *Subject Heading:* **1. Magnetic disturbances.**—*C.E.P.B.*

6.6–354 550.385

Lewis, R. P. Waldo, **The geomagnetic post-perturbation effect.** *Journal of Atmospheric and Terrestrial Physics*, 6(2/3):129-132, March **1955.** fig., 5 refs., 4 eqs. **DWB**—The evidence that during magnetically quiet days following disturbance horizontal force H increases slowly for periods of the order of 14 days or more is considered invalid. Two methods of estimating the time for depression of H to be reduced to 0.1 of its value give intervals of about 2 days. *Subject Heading:* **1. Magnetic disturbances.**—*C.E.P.B.*

6.6–355 550.385(52)

Rikitake, T. and Yokoyama, I., **Anomale erdmagnetische Variationen von kurzer Periode in Japan.** [Anomalous short period geomagnetic variations in Japan.] *Naturwissenschaften*, 41(18):420–421, Sept. **1954.** fig., 3 refs. **DWB**—Horizontal and vertical geomagnetic components at 5 Japanese observatories during a typical bay disturbance are illustrated. Mean values $\Delta Z/\Delta H$ are plotted, showing a very rare distribution exceeding 1.0 in SE Japan. This is attributed to electric conductivity of the ground possibly associated with a seismic center. *Subject Headings:* **1. Magnetic disturbances 2. Japan.**—*C.E.P.B.*

6.6–356 550.385

Rougerie, Paul, **Les baies géomagnétiques enregistrées à l'Observatoire du Val-Joyeux.** [Geomagnetic bays recorded at Val-Joyeux Observatory.] *Annales de Géophysique*, 10(1): 47–58, Jan./March **1954.** 10 figs, 6 tables, 11 refs. French and English summaries p. 47. **MH-BH**—Presents statistics of geomagnetic bays perturbations: diurnal and annual variations of frequencies, magnitudes and durations. The deflections of the vertical component are in opposite senses at Val-Joyeux and at Tortosa. *Subject Headings:* **1. Magnetic disturbances 2. Val-Joyeux, France.**—*Author's abstract.*

6.6–357 550.385

Wiese, H., **Erdmagnetische Baystörungen und ihr heterogener im Erdinnern induzierter Anteil.** [Geomagnetic bay disturbances and their heterogenous component induced in the earth's interior.] *Zeitschrift für Meteorologie*, 8(2/3):77–79, Feb./March **1954.** 3 figs., 15 refs. **DWB**—A "bay disturbance" is understood as the field of a dipole travelling in the auroral zone. Its direction has a diurnal variation. Synoptic "dynamic" anomalies in central Europe are explained by local variations in the induced earth component. The attack of corp iscules seems to be localized. *Subject Headings:* **1. Geomagnetic disturbances 2. Solar-terrestrial relationships 3. Central Europe.**—*A.A.*

6.6–358 91.04(99)

Law, Phillip, **The Australian Antarctic expedition to MacRobertson Land, 1954.** *Geographical Journal*, 120(4):409–421, Dec. **1954.** 3 figs., 4 photos, 9 refs. **DWB**—General account of this surveying expedition with only incidental remarks on weather. *Subject Headings:* **1. Antarctic expeditions 2. Australian Antarctic Expedition, 1954.**—*C.E.P.B.*

PART II. SELECTIVE ANNOTATED BIBLIOGRAPHY ON CLOUD PHYSICS

By: *Geza Thuronyi and Mary L. Rice*

INTRODUCTORY NOTE

The present bibliography is a supplement to that on **Cloud physics and "Rain Making"** which appeared in *Meteorological Abstracts and Bibliography*, 1(3):174-205, March 1950 (see item 6F-62). References included in that bibliography have not been repeated here. Of the literature prior to 1950, only representative examples have been included herein. Thus the bulk of this bibliography consists of literature on cloud physics published since 1950. The enormous number of contributions to the broad field of cloud physics made it necessary to divide the subject according to four different aspects, each of which will be covered in a separate bibliography. The present bibliography takes up (1) general works in cloud physics and (2) works dealing with the specific subjects of formation and structure of clouds and cloud particles and the formation and mechanism of precipitation. A second bibliography (to be published in our July 1955 issue) will be a supplement to a previous bibliography (2H, August 1951) dealing with cloud physics and other studies by means of radar. Two subsequent bibliographies will cover the fields of Condensation and Sublimation Nuclei (no bibliography on this subject has been published) and of Artificial Modification of Clouds (as a supplement to C, March 1950), respectively. Papers satisfying two or more of these aspects will, as a rule, be found in only one of the four bibliographies. It should be noted that the subjects of **Nuclei, Cloud Seeding** and **Radar** appear in the following outline. Abstracts of articles on other phases of cloud physics which touch on these subjects incidentally are included and reference made in the outline to the respective subjects. A much more thorough coverage of papers dealing primarily with radar meteorology, nuclei, and cloud seeding will, of course, be found in the subsequent bibliographies. Even dividing the field of cloud physics into the four above sub-areas, it is impossible to cover all of the material available on every aspect of the subject. We would be pleased to have anyone call our attention to serious omissions from these bibliographies.

In this bibliography we have repeated many items abstracted previously in MAB, but additional material (especially on borderline subjects) will be found in the following bibliographies previously published in MAB: **Hail,** 1(4):244–269, April, 1950; **Tornadoes,** 1(5):307–332, May, 1950; **Thunderstorms,** 1(8):517–551, Aug. 1950; **Icing,** 1(9):593–619, Sept. 1950; **Condensation Trails,** 2(9):765–782, Sept. 1951; **Dew,** 3(4):360–391, April 1952; **Stratus Forecasting,** 3(6):573–596, June 1952; **Glaze and Rime,** 3(10):1066–1101, Oct. 1952; **Vertical Motions,** 5(8):949–972, Aug. 1954.

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1905

6F–1 551.578.11:551.501

*Defant, Albert, **Gesetzmässigkeiten in der Verteilung der verschiedenen Tropfengrössen bei Regenfällen.** [Regularities of drop size distribution in rainfall.] *Akademie der Wissenschaften Vienna, Sitzungsberichte, Mathematisch-Naturwissenschaftliche Klasse,* 2a, 114:585–646, 1905. 4 figs., 5 tables, refs. **DLC**—A method of raindrop size measurement (a refinement of WIESNER's blotting-paper technique) is described in detail. The method was applied to drop size distribution measurement in 7 light rains and 13 showers. Results are tabulated and graphs of average drop-size distribution in light and in heavy rain presented. In a theoretical analysis of the distribution curves (which show the same relative size frequency maxima in light and in heavy rain) the author arrives at the hypothesis of raindrop growth by coalescence. *Subject Headings:* **1. Raindrop coalescence 2. Raindrop size distribution 3. Raindrop size measurement.**—*G.T.*

1909

6F–2 551.578.1:551.501

*Schmidt, Wilhelm, **Eine unmittelbare Bestimmung der Fallgeschwindigkeit von Regentropfen.** [Direct measurement of the falling velocity of raindrops.] *Akademie der Wissenschaften, Vienna, Sitzungsberichte, Mathematisch-Wissenschaftliche Klasse,* 2a, 118(1):71–84, Jan. **1909.** 2 figs., 2 tables, ref., 4 eqs. **DLC**—An apparatus for simultaneous measurement of fall velocity and size of droplets is described. It consists of two circular plates mounted horizontally on the same axis at a given distance from each other and rotating at a given speed. Drops falling through a slot in the upper plate leave their marks on a sampling paper on the lower plate. From the positions (in relation to the slot in the upper plate) of drop marks of various sizes the fall velocity as a function of drop diameter can be calculated. As a result of measurements made with this apparatus, fall velocities of droplets with radii from 0.193 mm to 1.67 mm are tabulated and graphically presented. Results obtained are compared with those obtained by other investigators, with general agreement for large drops. For smaller drops the fall velocity is found to be much smaller than assumed previously. *Subject Headings:* **1. Raindrop velocity measurement 2. Raindrop size measurement.**—*G.T.*

1919

6F–3 551.576.11:551.508.92

Richardson, L. F., **Measurement of water in clouds.** *Royal Society of London, Proceedings, Ser. A,* 96(674):19–31, Aug. 1, **1919.** 3 figs., refs., 34 eqs. **DLC**—Describes special apparatus for photometric measurement of water content of (a) thin clouds and (b) thick stratus. The theory of deriving water content amounts from photometric values is included. *Subject Headings:* **1. Water content of clouds 2. Photometers.**—*G.T.*

1922

6F–4 551.574.6 551.574.41

Köhler, Hilding, **Zur Kondensation des Wasserdampfes in der Atmosphäre.** [Condensation of water vapor in the atmosphere, Pt. I.] *Geofysiske Publikasjoner,* Oslo, 2(1), **1921.** 15 p. fig., 2 tables, 7 refs. Pt. II, *Ibid.,* 2(6), **1922.** 53 p. 15 figs., photo, 11 tables, 27 refs.

DLC—Fundamental investigation of the condensation processes in the atmosphere. In Pt. I, the author analyzes empirical formulas for water vapor condensation and gives characteristics of the physical processes of dew formation. He pays special attention to water vapor condensation at temperatures below the freezing point and to ice crystal formation. Various forms of condensation (in clouds, fog, dew and ice crystals) and methods of investigating them are discussed in Pt. II. (*Same item as* 3D–86, April 1952, *MAB.*) *Subject Headings:* **1. Condensation 2. Dew formation 3. Ice crystal formation.**—*N.T.Z.*

6F–5 551.576

Schereschewsky, Ph. and Wehrle, Ph., **Les systèmes nuageux.** [Cloud systems.] *France. Office National Météorologique, Memorial*, no. 1, **1922–1923.** [3 v.] [v. 1], Text, pub. 1923. 77 p. 3 figs. [v. 2], Maps, pub. 1923. unpaged. 33 plates (fold. in color). [v. 3], Photographs, pub. 1922. 26 photos (many in color). **DLC**—This is the first major study dealing with cloudiness in terms of synoptic analysis of large scale cloud systems rather than of an observation of the succession of clouds at a given place. A technique is worked out for drawing charts of cloudiness, and distinguishing between cloud types. Many sample charts of cloudiness over Europe (1920–1922) are presented, showing typical situations of cloudiness and corresponding pressure development. The connection of various cloud formations with dynamic processes of the atmosphere is discussed and illustrated with good photographs. *Subject Headings:* **1. Cloudiness data 2. Cloud formations 3. Cloud charts.**—*G.T.*

1931

6F–6 551.574.1:551.594.25

Wigand, A. and Frankenberger, E., **Die elektrostatische Stabilisierung von Nebel und Wolken und die Niederschlagsbildung.** [Electrostatic stabilization of fog and clouds and precipitation formation.] *Annalen der Hydrographie und Maritimen Meteorologie*, 59(10, 11):353–363; 398–403, **1931.** 13 figs., 2 tables, refs., eqs. **DLC**—A theory is advanced in which the stability of fogs and clouds is explained by the mutual repulsion of droplets having electrical charges of the same sign. Electrical charge values required to maintain such a stability are calculated and found to be in agreement with drop charge measurements made in natural fogs. The contribution of coagulation to the formation of precipitation and to the diffusion of clouds or fog is investigated. *Subject Headings:* **1. Electrical charges on drops 2. Precipitation formation 3. Cloud diffusion.**—*G.T.*

1932

6F–7 551.578.11:551.501

*Niederdorfer, Erich, **Messungen der Grösse der Regentropfen.** [Raindrop size measurements.] *Meteorologische Zeitschrift*, 49(1):1–14, Jan. **1932.** 5 figs., 2 tables, refs. **DWB**—The author measured raindrop size distribution in eight rainfalls (Eisenkappel, Austria from April to Oct., 1929) using WIESNER'S blotting-paper technique. Tables and graphs of the drop size distribution are presented. Drop size frequency maxima show remarkable regularity, suggesting the validity of theories claiming drop growth by coalescence of equal drops, as suggested by DEFANT (1905) or KÖHLER. *Subject Headings:* **1. Raindrop size distribution 2. Raindrop size measurements.** —*G.T.*

1933

6F–8 551.576.11:551.571.1

Findeisen, Walter, **Über Wasserdampfübersättigungen in Wolken.** [Water vapor supersaturation in clouds.] *Beiträge zur Physik der freien Atmosphäre*, 20(3):157–173, **1933.** tables, refs., 23 eqs. **DLC**—An analysis of diffusive exchange between the atmosphere and the cloud droplets suspended in it shows that supersaturation reaches an equilibrium value very rapidly both in ascending (cumulus) and in stationary clouds (stratus, fog). A formula is developed for calculating the equilibrium value of supersaturation from pressure, temperature, vertical velocity, drop size and number of drops within the cloud. Numerical examples of the calculation are given. The supersaturation values thus obtained are considerably smaller than those suggested by W. KOPP. *Subject Heading:* **1. Supersaturation in clouds.**—*Trans. from author's abstract.*

6F–9 551.576.11:551.511

Walker, Sir Gilbert T., **Clouds and cells.** *Royal Meteorological Society, Quarterly Journal*, 59(252):389–396, Oct. **1933.** 13 figs., refs. **DLC**—Evidence of cellular motion in the atmosphere is derived from laboratory experiments and cloud observations. Cloud types indicating small-scale or large-scale cells are described and shown in good photographs. *Subject Headings:* **1. Cloud formations 2. Convective cells.**—*G.T.*

1934

6F–10 551.574.1 551.578.11:551.594.12

†Bennett, M. G., **The condensation of water in the atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 60(253):3–14, Jan. **1934.** 30 refs., 5 eqs. **DLC**—Problems connected with the nature, origin, growth and distribution of condensation nuclei, with the mechanism of drop formation and growth, and with electric charges in drops are reviewed in the light of existing knowledge as reflected in the works of some 25 authors. *Subject Headings:* **1. Condensation nuclei 2. Droplet growth 3. Electric charges on drops.**—*G.T.*

1935

6F–11 551.574.1

Aganin, M. A., **Zakony sliianiia kapel' vody.** [Laws of the coalescence of water drops.] *Zhurnal Geofiziki*, Moscow, 5(4):409–443, **1935.** 3 figs., 16 tables, 15 refs., 2 eqs. German summary p. 443. **DLC**—Description of experiments carried out to study the laws of coalescence of water drops using a thin layer of water placed on a glass plate. Results show that the coalescence is of three types: 1) coalescence caused by the high speed of collision; 2) coalescence produced by the high electric charge of the drops and 3) coalescence induced by a connecting filament formed between the drop and the water layer as the result of a small electric charge on the drop. When the speed of collision is so small that forces causing the rebounding of drops are not able to break the filament the drop coalesces with the water layer through this filament. The author discusses some laws concerning these 3 types of coalescence and shows that coalescence of the third kind occurs most often in the atmosphere. Peculiarities of the third type of coalescence explain why only almost similar drops coalesce in the free atmosphere and why very light or heavy winds have a stabilizing effect on clouds. Thus, the physical objection to the Elster-Geitel hypothesis of the electrification of cloud elements by electrical induction of the terrestrial field is also removed. *Subject Headings:* **1. Drop formation 2. Coalescence of drops.**—*A.M.P.*

6F–12 551.574.1

Becker, R. and Döring, W., **Kinetische Behandlung der Keimbildung in übersättigten Dämpfen.** [Kinetic treatment of the nucleation in supersaturated vapors.] *Annalen der Physik, Leipzig*, 24(6):719–752, **1935. DLC.** Translation by J. Vanier, in *U. S. NACA, Technical Memorandum*, No. 1374, Sept. **1954.** 43 p. 8 figs., 5 refs., 43 eqs. **DLC**—The equations of the individual processes of self nucleation are utilized through an electrical analogy to obtain the nucleation frequency. This process is shown to be shorter and less subject to error than that of previous investigators since the appearance of indeterminant integration constants is completely avoided. With the nucleation frequencies of crystals and spheres the Ostwald law of stages is reviewed and modified. In the final section the general resistance image is discussed and mention is made of the relation of the electrical network and Volmers formula. *Subject Headings:* **1. Nucleation processes 2. Electrical analogy 3. Supersaturation. I. Vanier, J.** (*trans.*).—*NACA abstract.*

6F–13 551.574.1

Gorbachev, S. V. and Nikiforova, V. M., **O verkhnem predele ustoichivosti kapel' vody pri ikh soudarenii.** [On the upper limit of stability of colliding water drops.] *Zhurnal Geofiziki*, Moscow, 5(2):237–246, **1935.** 9 figs., 9 tables, 4 refs. French summary p. 246. **DLC**—Experimental investigations of the inter-collision of fluid drops in a gaseous medium to clarify elementary processes in fogs are described and discussed. The investigations were carried out by two methods: the pendulum and the slider method. It has been established that either coalescence or disintegration of the drops occurs with collisions at speeds varying between 0.1 and 1.5 m/sec; that speed limits necessary for disintegration of drops increase with the decrease of drop size; that drops of substances with high surface tensions cause a reduction of disintegration speed limits, especially with large angles of collision. Qualitative and quantitative results given by the two methods are identical. *Subject Headings:* **1. Water drop collision 2. Coalescence of water drops.**—*A.M.P.*

1937

6F–14 551.574.1(02)

Findeisen, W., **Mikrophysik der Wolken.** [Microphysics of clouds.] Also: Peppler, W., **Makrophysik der Wolken.** [Macrophysics of clouds.] Also: Bergeron, Tor, **Physikalische Synoptic der Wolken.** [Physical synoptics of clouds.] Berlin, **1937.** 25 p. Prospectus of forthcoming **Physik der Wolken,** [pub. 1939?]. **DWB**—This pre-publication outline to a book (published book unchecked) contains a very detailed arrangement of headings and sub-headings with summaries of contents. Pt. 1 (by Findeisen) takes up (A) Water clouds: (a) condensation nuclei, (b) condensation processes, (c) droplets, (d) water vapor, (e) coagulation, (f) precipitation, (g) optical phenomena in clouds, (h) acoustical phenomena; (B) Ice clouds (with similar subject headings); (C) Mixed (water and ice) clouds. Pt. 2 (by Peppler) deals with formation and dissipation processes

n various types of clouds. Pt. 3 (by Bergeron) discusses the various cloud forms in connection with ynoptic weather development. *Subject Headings:* **1. Cloud physics 2. Textbooks.**—*G.T.*

6F–15 551.576.11:77

Mügge, R., **Wolken in Bewegung.** [Clouds in motion.] *Meteorologische Zeitschrift*, 54(3): 31–90, March **1937.** 6 figs., 32 refs. **DWB**—Several time-lapse motion pictures of clouds were prepared for the German Bureau of Educational Films. This paper contains a review of the contents and results of these motion pictures in the following subject arrangement: 1. Cumulus clouds, 2. Stable warm-front processes, 3. Castellatus processes (moist adiabatic lifting), 4. Cloud forms of non-ascending air currents, 5. Spreading and dropping of clouds and 6. Panoramic view of the sky. *Subject Headings:* **1. Cloud photography 2. Cloud structure.**—*G.T.*

1938

6F–16 551.576.11:551.574.4

Vorontsov, P. A. (*Leningrad*), **K voprosu o stroenii oblakov.** [Structure of clouds.] *Meteorologiia i Gidrologiia*, No. 11/12:40–50, Nov./Dec., **1938.** 5 tables, 2 refs. **DLC**—The study is based on the premise of the relation between the shape of hydrometeors, settling on objects in the air or precipitated on the ground, and the structure of a cloud. Based on data on icing of kites and planes, the author presents a classification of hydrometeors captured on objects in clouds, and a corresponding classification of cloud structures. The distribution of possibility of icing on planes depends on the shape of clouds and the season of the year. The mean altitude and thicknesses of clouds of various forms are analyzed. *Subject Heading:* **1. Cloud structure.**—*C.K.*

1939

6F–17 551.551:551.576.11

Arenberg, David L., **Turbulence as the major factor in the growth of cloud drops.** *American Meteorological Society, Bulletin*, 20:444–448, Dec. **1939.** 3 figs., 5 refs., 16 eqs. **MH-BH**—Since other factors are insufficient to explain the growth of cloud drops, turbulence is discussed as possibly being the major factor in producing active precipitation. Visual observation establishes the fact that for small drops suspended in a cloud the flow pattern of the sustaining medium is the most important factor in governing their motion. (*Same item as* 3K-51, Nov. 1952, *MAB.*) *Subject Headings:* **1. Turbulence in clouds 2. Cloud physics.**—*H. P. Kramer.*

6F–18 551.574.1

Scrase, F. J., **Condensation and precipitation in the atmosphere.** *Meteorological Magazine*, London, 74(882):161–166, July **1939.** **DLC**—A concise review of the then current ideas of cloud physics: supersaturation, hygroscopic nucleation, size of droplets, falling velocity, coalescence (it was thought that electrical action could produce only repulsion of droplets, not coalescence), coexistence of three states of water, temperatures at which these states exist, origin of ice crystals, non-precipitating clouds and their cause, warm clouds in the tropics and resulting rain, etc. *Subject Headings:* **1. Cloud physics 2. Condensation of water vapor 3. Precipitation formation.**—*M.R.*

1940

6F–19 551.574.1:551.576(02)

Coulomb, J. (*Dir. Institut de Mét. et de Physique du Globe de l'Algérie*) and Loisel, J., **La physique des nuages.** [Cloud physics.] Paris, Albin Michel, [**1940**]. 282 p. 161 figs. **DLC**—One of the first and most comprehensive works on cloud physics. Beginning with history of cloud classification, the current international classification, cloud types, sub-species and varieties, the text goes on to discuss theory of condensation and sublimation, change of state, heat of condensation, effects of convection, turbulence, mixing, radiation and waves, lenticular clouds, orographic clouds; instability clouds, air mass and frontal (warm and cold) clouds; condensation nuclei, ions, hygroscopic nuclei, haze, coalescence of drops, freezing, ice forms, virga; optical phenomena (halos, coronas, etc), nocturnal clouds, nacreous clouds, lightning and electricity of convection clouds. Profusely illustrated and well-indexed. Each individual cloud type is discussed in a separate chapter. (*Same item as* C–35, March 1950 and 4.5–155, May 1953, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Atmospheric turbulence 3. Cloud classification 4. Noctilucent clouds 5. Textbooks.**—*M.R.*

6F–20 551.576.11

Findeisen, W., **Die Entstehung der 0°-Isothermie und Fraktocumulus-Bildung unter Nimbostratus.** *Meteorologische Zeitschrift*, 57(2):49–54, Feb. **1940.** 5 figs., refs., 11 eqs. **DWB.** Trans. as: **The formation of the 0°-isothermal layer and fractocumulus under nimbostratus.** [n.d.] 8 p. 5 figs., refs., eqs. **DWB**—The formation of an isothermal layer at the freezing point, often observed during aerological ascents, is explained by the melting of falling ice particles. The

duration of precipitation necessary to form an isothermal layer of certain thickness is computed (1 min. for 24 m, 4 hrs. for 370 m) as well as for the formation of a Fcu layer. The vertical velocity of air, which prevents the further growth of the isothermal layer, is 24 cm/sec for a thickness of 20 m and 1.2 cm/sec for 400 m. (*Same item as* 5.2–205, Feb. 1954, *MAB.*) *Subject Headings.* **1. Cloud physics 2. Isothermal layer 3. Fractocumulus clouds. I. Glaser, Arnold** (*trans.*).—*A.A.*

6F–21 551.515.4 551.594.21 551.576

Kähler, Karl F., **Wolken und Gewitter.** [Clouds and thunderstorms.] Leipzig, **1940.** 158 p. 26 figs., 13 tables, refs., eqs. **DLC**—A simple text on (A) Cloud forms and classification, (B) Cloud physics and (C) Thunderstorms. Sec. B (p. 62–105) deals with the composition of clouds (droplets, crystals, graupel and hail), the formation of clouds (water vapor, condensation nuclei, meteorological factors contributing to cloud formation and cloud classification according to origin) and artificial clouds (clouds produced by industrial activities, condensation trails). (*Same item as* H–93, Aug. 1950, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Thunderstorms.**—*G.T.*

6F–22 551.574.1:016 551.576:016

†Süring, R., **Wolkenbildung, Wolkenstruktur und Niederschlag.** [Cloud formation, cloud structure and precipitation.] *Zentralblatt für Geophysik, Meteorologie und Geodäsie*, Berlin, 5(1): 1–10, Jan. 31, **1940.** table, bibliog. p. 9–10. Russian trans. in *Meteorologiia i Gidrologiia*, No. 12:101 108, Dec. **1940.** Trans. ed. I. P. Smirnov. **DLC**—The late Prof. Süring presents in this review a detailed history of progress in study of the microphysics of clouds (1905–1939), on studies of particular forms of clouds—cirrus, cumulus, and orographic (1889–1939) and on cloud atlases and cloud motion pictures (1930–39). The bibliography contains 50 references to pertinent literature from German and other sources. (*Same item as* 6B–28, Feb. 1955, *MAB.*) *Subject Headings:* **1. Cloud physics bibliographies 2. Progress in cloud physics research.**—*M.R.*

1941

6F–23 551.574.1:551.576.1:551.577.11

Simpson, Sir George C., **On the formation of cloud and rain.** *Royal Meteorological Society, Quarterly Journal*, 67(290):99–133, April **1941.** 5 figs., 7 tables, 24 refs. **DLC**—An excellent summary of the physics of cloud formation, the knowledge of which is necessary for an understanding of exhaust trails. The relative importance of various types of condensation and sublimation nuclei is weighed. (*Same item as* 2I–76, Sept. 1951, *MAB.*) *Subject Headings:* **1. Condensation trails 2. Cloud physics research 3. Condensation nuclei 4. Sublimation nuclei.**

1943

6F–24 551.571.1:551.574.1

Sander, Adolf and Damköhler, Gerhard, **Übersättigung bei der spontanen Keimbildung in Wasserdampf.** *Naturwissenschaften*, Berlin, 31(39/40):460–465, Sept. 24, **1943. DLC.** Translation by Mary Mahler as **Supersaturation in the spontaneous formation of nuclei in water vapor.** *U. S. NACA, Technical Memorandum*, No. 1368, **1953.** 19 p. 6 figs., 13 refs., 15 eqs. **DLC**—The supersaturation of water vapor required for spontaneous formation of nuclei was measured in the temperature range between +35° and −75°C. The influence of the presence of ions on the condensation process was found to disappear and a break in the critical supersaturation as a function of temperature curve was found at −62°C. In addition, the condensate particles were observed to scintillate at −62°C or lower. A modified form of the Volmer and the Becker-Doring equations for rate of nucleus formation is presented and compared with the experimental data. The temperature range of droplet-nucleus formation and crystal-nucleus formation are considered as two distinct (not overlapping) temperature regions separated by the melting point (62°C) of two-dimensional surface phase. (*Same item as* 6.3–204, March 1955, *MAB.*) *Subject Headings:* **1. Supersaturation 2. Condensation nuclei 3. Translations. I. Mahler, Mary** (*trans.*).—*NACA abstract.*

1944

6F–25 551.574.1 551.5(02)

Byers, Horace Robert, **General meteorology.** New York, McGraw-Hill, **1944.** 645 p. 300 figs., 26 tables, refs., numerous eqs. **DWB**—A textbook, combining synoptic and dynamic meteorology, which reviews advances in meteorology in the U. S. since 1937. Most of the scientific information available at the time on such subjects as: constitution of clouds, condensation, fog forecasting, ice in stratified clouds, thunderstorm electricity and vertical currents is included. Ch. VI, Upper air cloud observations; Ch. XX, Condensation and precipitation; Ch. XVI, Fog; Ch. XXII, The formation of ice on aircraft, and Ch. XXIII, Thunderstorms, contains material applicable to the subject of cloud physics. Many excellent illustrations have been provided. (For fuller abstracts of pertinent sections *see items* D–49, April 1950; 4B–330, Feb. 1953 and 5H–23, Aug. 1954, *MAB.*) *Subject Headings:* **1. Meteorology textbooks 2. Cloud physics.**—*M.L.R.*

6F–26 551.594.25:551.578.1

Drukarev, G., **O zariade dozhdevykh kapel'.** [On the charge of rain drops.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog. i Geofiz.*, Moscow, 8(6):330–336, **1944.** fig., 4 refs., eqs. English summary p. 336. **DLC**—Discusses failure of existing theories on the charge of raindrops. The E charge of raindrops polarized by cloud electric fields under effect of 2 rival processes is analyzed: predominant positive-ion flow in the given field and predominant absorption of negative ions by the drops. It is shown that the prevalence of positively charged drops in steady rain can be easily explained. The calculated charge value is in agreement with experimentally obtained values. *Subject Heading:* **1. Electrical charges on raindrops.**—*A.M.P.*

1945

6F–27 551.574.41

Archbold, J. W., **Preliminary note on condensation in the form of clouds and dew.** *Philosophical Magazine*, London, 34(236):632–642, Sept. **1943.** *Also:* **Second note**, *Ibid.*, 36(257):414–418, June **1945.** 11 figs., 38 eqs. **DLC**—In this theoretical study based on classical statistical mechanics, laws governing the growth of water drops suspended in the air are developed. Quasi-statical conditions at uniform temperature are assumed; the earth's gravitational field and electrical charge within the cloud are considered. The author concludes that (1) gravity appears to have no significant effect on the growth of drops and (2) the size distribution of drops depends on the distribution of electrical charge. (*Same item as* 3D–177, –183, April 1952, *MAB.*) *Subject Headings:* **1. Condensation 2. Cloud drop size 3. Electricity in clouds.**—*G.T.*

6F–28 551.571:551.574.1

Köhler, Hilding, **Vattnet i Atmosfären.** [The water in the atmosphere.] *Uppsala. Universitet, Meteorologiska Institutionen, Meddelande*, No. 9, [1945]. 4 figs. Reprinted from *Ymer*, Stockholm, Sept., **1945.** p. 103–114. **DWB**—After an historical review of various theories on the formation of clouds, rain and icing as a function of condensation, some details of role of condensation in the atmosphere are discussed. Author's theory that particles of oceanic salt are condensation nuclei recognizes other hygroscopic nuclei. Investigations have shown that clouds generally, even below 0°, consist of supercooled water drops and not of ice crystals. The latter form clouds of a distinct class. Icing is due to supercooled water drops and increases or decreases with magnitude and number of the water drops. (*Same item as* 4.8–176, Aug. 1953, *MAB.*) *Subject Headings:* **1. Water vapor 2. Condensation nuclei 3. Cloud physics.**—*W.N.*

6F–29 551.574.7:551.508.7:551.576:06

Langmuir, Irving, **Final report on icing research up to July 1, 1945.** General Electric Research Laboratory, Contract W-33-038-AC-9151, [Report], Oct. **1945.** 33 p. 2 tables, 7 eqs. Mimeo. **Mount Washington Observatory Library**—Contains list of reports under this contract with the Air Technical Service Command. Study made of fundamental phenomena involved in icing of aircraft: meteorological aspects, cloud physics, water droplets in clouds, etc.; phenomena of ice deposition; and icing prevention. It is concluded that for determination of liquid water content and average drop size in clouds ice deposition on rotating multicylinders is most trustworthy procedure. Brief resume of General Electric instrumentation program. Suggestions for furthering knowledge in icing problem listed. (*Same item as* I–98, Sept. 1950, *MAB.*) *Subject Headings:* **1. Icing of aircraft 2. Cloud physics 3. Icing research 4. Icing meters.**—*H. P. Kramer.*

1946

6F–30 551.594.25:551.578.1

Frenkel', IA. I. and Shishkin, N. S., **Rol' koagulatsii vodnykh kapel' v vozniknovenii grozovykh razriadov. I.** [The role of coagulation of water drops in the origin of lightning discharges. Pt. I.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geog. i Geofiz.*, 10(4):301–312. **1946.** 7 refs., 25 eqs. English summary p. 311–312. Shishkin, N. S., . . . **Pt. II,** *Ibid.*, p. 313–316. 3 refs., 13 eqs. English summary p. 316. **DLC**—A theory is developed for the formation of anomalous electrostatic potential gradients in clouds and lightning discharges related to the concentration of charges on drops during coagulation with small drops. The first paper, treating the cases of stationary and frontal nimbostratus clouds, shows that when the rate of discharge by falling drops is slower than their rate of growth, discharge values of the field $E \sim 10^4$ V/cm arise in the region where the drops reach the size of $r \sim 3.10^{-2}$ cm. In the second paper the theory is expanded for cumulonimbus clouds. Calculations show a speedier growth of drops falling through the cloud. The electric gradient inside the cloud remains unchanged in the region where the drop radius attains $r \sim 3.10^{-2}$ cm. *Subject Headings:* **1. Electrical charges on drops 2. Drop growth 3. Thunderstorm electricity.**—*A.M.P.*

6F–31 551.574.1:551.510.42

Krasikov, P. N., **Usloviia ravnovesiia v vodnykh aerozoliakh.** [Conditions of equilibrium in water aerosols.] *Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby, Trudy Nauchno-issledovatel'skikh Uchrezhdenii, Ser. I, Meteorologiia,* No. 34:34–57, **1946.** 10 figs., 5 tables, 12 refs., eqs. **DLC**—The author analyzed the distribution of water, in liquid and vaporous state, in aerosols. The term water aerosols is used for the drops of inorganic compound solutions in humid air, for example clouds, artificial fog and smoke. With low relative humidity these aerosols do not affect the existence of clouds and fog. The tension of the water vapor also is independent of the surplus amount of the aerosols in formed system. *Subject Headings:* **1. Aerosols 2. Fog 3. Smoke 4. Humidity.**—*N.T.Zikeev.*

1947

6F–32 551.577.11

Dady, Georges, **Contribution à l'étude des précipitations.** [Contribution to the study of precipitation.] *Académie des Sciences, Paris, Comptes Rendus,* 225(25):1349–1351, Dec. 22, **1947.** refs. **DLC**—Report on cloud-chamber experiments which attempted to determine the mechanism of the growth of droplets, and in particular to decide between the relative merits of the two schools advocating theories of direct and indirect coalescence, respectively. The experiments appear to favor theories involving evaporation and condensation effects rather than mechanical collision processes. (*Same item as* 1–102, Jan. 1950, *MAB.*) *Subject Headings:* **1. Cloud chamber experiments 2. Drop growth.**—*G.T.*

1948

6F–33 551.574

Dessens, Henri, **Sur les divers modes de condensation de la vapeur d'eau atmosphérique.** [On the different condensation mechanisms of atmospheric water vapor.] *Académie des Sciences, Paris, Comptes Rendus,* 226(4):351–352, Jan. 26, **1948.** fig., ref. **DLC**—Effect of sodium chloride on formation of ice from supercooled water, etc. (*Same item as* 2–137, Feb. 1950, *MAB.*) *Subject Headings:* **1. Condensation processes 2. Saline nuclei.**—*H.P. Kramer.*

6F–34 551.576.11

Hewson, E. Wendell, **The dissipation of scattered and broken cloud.** *Royal Meteorological Society, Quarterly Journal,* 74(321–322):243–265, July–Oct. **1948.** 14 figs., 19 refs. **DWB**—A comprehensive treatment of the subject based on the earlier work of SHAW, and refinements by J. BJERKNES, PETTERSSEN, BEERS, NORMAND and others. In addition to careful consideration of the theoretical aspects of terrestrial and cloud radiational effects, the author takes up the various criteria which may determine whether or not clouds will dissipate; the use of the slice method; computation of time required for dissipation; effects of liquid water content of clouds, solar radiation, widespread subsidence or ascent of air. Each step is illustrated by means of tephigram charts showing lapse rates and critical limits. The paper was prepared in 1942 but not published until 1948 due to the war. (*Same item as* 2–141, Feb. 1951, *MAB.*) *Subject Heading:* **1. Cloud dissipation.**—*C.E.P.B.*

6F–35 551.577(773)

*Huff, Floyd A. and Stout, Glenn E., **Report of May–June 1948 rainfall in the vicinity of El Paso, Illinois. In cooperation with Pfister Hybrid Corn Company.** Illinois State Water Survey, August **1948.** 7 p. 2 tables. Also their **Report of July 1948 rainfall . . .** pub. Aug. 16, **1948.** 2 figs., 2 tables. Also their **Report of Aug. 1948 rainfall . . .** pub. Sept. 20, **1948.** 4 p. table, chart. Also their **Report of September 1948 rainfall . . .** pub. Oct. 27, **1948.** 2 p. table. **DWB**—Daily and monthly totals from a network of 47 gages over 250 sq. mi. established with a radar set for the evaluation of natural and induced precipitation. *Subject Headings:* **1. Diurnal precipitation data 2. Artificial precipitation 3. El Paso, Ill.**—*A.A.*

6F–36 536.421:546.212

Kaitera, Penti, **Keeping the water from freezing by means of compressed air.** *International Union of Geodesy and Geophysics, International Association of Scientific Hydrology, Oslo,* 1948 [*Transactions*], 1:295–296, **1948.** **DWB**—Freezing of smaller water areas can be prevented by utilizing the thermal reserves of water. Turbulence is caused by air bubbles from compressed air pumped in the bottom layers of the water. Experiments were successful even at air temperatures down to −40°C. Melted ice volume varied from 0.25–16 m^3 in 24 hours at water temperatures from 0.2°C to 4.2°C. Direct melting of the ice would require 20–600 times more energy dependent on the temperature of the water. *Subject Heading:* **1. Supercooling of water.**—*A.A.*

6F–37 551.577.53:551.509.67

Langmuir, Irving, **The production of rain by a chain reaction in cumulus clouds at temperatures above freezing.** *Journal of Meteorology*, 5:175–192, Oct. **1948.** 12 tables, 12 refs., 42 eqs. **DWB.** Also issued as: General Electric Research Laboratory, Occasional Report, No. 1, Project Cirrus, Schenectady, April 15, **1948.** 26 p. 13 tables, refs. **DWB**—Theory of cloud droplet growth. Natural processes in formation of heavy rain. Accretion theory of growth of raindrops. Deposition of rime on cylinders, spheres and ribbons. Calculation of terminal velocity of a falling drop, of effective efficiency of droplet collection by falling drops; rate of growth of falling drops by accretion; Hawaiian experiments in seeding above 0°C, rain produced by chain reaction; types of rain and snow in response to seeding; self propagation of storms; divergent weather effect. (*Same item as* 1–109, Jan. 1950, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Drop accretion.**—*M.R.*

6F–38 551.574.1:532.77

Schulz, Gerhard, **Der Einfluss von Fremdkörpern auf die Unterkühlungsfähigkeit des Wassers.** [The influence of foreign substances on the supercooling capacity of water.] *Meteorologische Rundschau*, 1(7/8):237–241, Jan./Feb. **1948.** fig., 7 tables, 5 refs. **DWB**—As a result of experiments conducted during 1942–1944 at the Cloud Research Laboratory of the Reichsamt für Wetterdienst, tables showing the upper and lower limits of the freezing point of water, containing various solid or gaseous impurities, are presented. The apparatus used is described and illustrated. The conclusion is that the artificial freezing nuclei must be of the same general crystalline structure as ice and must have freshly exposed surfaces to be effective. Size of nuclei is of no consequence but presence of air in the water aids ice formation. Sand and dust from various sources were tested. FINDEISEN succeeded in producing virga artificially from supercooled water clouds (1–9°C) by seeding with the finest powdered sea sand. (*Same item as* 7–86, July 1950, *MAB.*) *Subject Headings:* **1. Supercooled water 2. Freezing nuclei 3. Cloud seeding.**—*M.R.*

1949

6F–39 551.577.2:519.24(47)

*Alekseev, G. A., **Statisticheskie zakonomernosti vypadaniia dozhdeĭ.** [Statistical regularities of rainfall distribution.] *Leningrad. Gosudarstvennyĭ Gidrologicheskiĭ Institut, Trudy*, No. 14(68): 123–176, **1949.** 24 figs., 9 tables, 11 refs., 59 eqs., append. **DLC**—A detailed treatment of the rainfall distribution in time and area. A simple theory for exhaustion of a rain cloud is given. The distribution in area can be characterized by the equation $H_f = H_0\left(1-\sqrt{\frac{F}{F_m}}\right)^2$; H_0 = maximal rainfall height in a central point at $F=0$; F_m = maximal area of the given rainfall; F = area, limited by the given isohyet H_f. The author gives ample results from observations for the entire black soil area and single stations. Data are added in an appendix. For the exposition of statistical regularities the author uses an integral method described in another paper (*see item as* 4.8–285, Aug. 1953, *MAB*). *Subject Headings:* **1. Rainfall distribution 2. Statistical studies 3. Exhaustion of rain cloud 4. European U.S.S.R.**—*A.A.*

6F–40 551.576.1:551.574.1

Howell, Wallace, **The growth of cloud drops in uniformly cooled air.** *Journal of Meteorology*, 5:134–149, April **1949.** 16 figs . 5 tables, 3 refs., 7 eqs. **DWB.** Also available in manuscript copy. 145 p. 22 figs., 11 tables, 39 refs., eqs. In library of Mt. Washington Obs.—A detailed and quantative treatment of the physics of cloud drop formation. According to this study for the case of uniformly cooled air, "the numerical concentration of drops is determined primarily by the rate of cooling during the initial stage of condensation. It depends, as a rule, only slightly on the concentration of condensation nuclei. With continued uniform cooling, the drop concentration diminishes slightly toward a fixed constant value." Also shown that uniform lifting leads to a rather uniform drop size distribution. (*Same item as* I–57, Sept. 1950, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Water content of clouds 3. Drop size distribution.**—*M.R.*

6F–41 551.57

Neiburger, Morris and Wurtele, M. G., **On the nature and size of particles in haze, fog and stratus of the Los Angeles region.** *Chemical Reviews*, Baltimore, 44(2):321–335, April **1949.** 4 figs., 6 tables, 23 refs., 13 eqs. **DLC**—Relative humidity in clouds at Los Angeles is often 90%, at rural Santa Maria generally 100%. Cloud droplets in equilibrium at 90% would require the improbable concentrations of 17% NaCl or 23% H_2SO_4, so difference is not due to combustion processes. Most frequent drop radius is 7μ except near base; it is inferred that increased condensation in stable clouds gives more but not larger droplets. Relation between visibility and drop size is determined from humidity and visibility. It is found that radius varies from 8μ at 98% R.H. to 3μ at 67.5% and number decreases from 23 to 7 per cc. (*Same item as* 3F–118, June 1952, *MAB.*) *Subject Headings:* **1. Haze 2. Fog 3. Stratus clouds 4. Drop size distribution 5. Los Angeles, California.**—*G.C. Bristow.*

6F–42 551.551:551.576.11 551.574.

Gabilly, A., **Sur le role que peuvent jouer les rafales dans la coalescence de gouttelettes d'u nuage.** [On the role that gusts play in the coalescence of cloud droplets.] *Annales de Géophysique* 5(3):232–234, July–Sept. **1949.** 6 refs, eqs. **MH-BH**—A theoretical analysis of the coalescenc of cloud droplets by the action of gusts which impart varying velocities to droplets of differen masses. An equation for calculating the number of droplets that coalesce given the number o droplets per cubic centimeter, velocity of the droplets and a coefficient of coalescence is derived Several numerical applications are presented. The efficiency of gusts rises very rapidly as th diameter of the droplets increases. (*Same item as* 2.1–130, Jan. 1951 and 4B–181, Feb. 1953, *MAB.* *Subject Headings:* **1. Gustiness 2. Cloud physics.**—*I.L.D.*

6F–43 551.576.

Kraus, E. B. and Smith, Betty, **Theoretical aspects of cloud drop distributions.** *Australian Journal of Scientific Research, Ser. A, Physical Sciences*, 2(3):376–388, Sept. **1949.** 7 figs., table 12 refs., 14 equations. **MH-BH**—A theoretical study of the relationships between meteorological variables (temperature, pressure, humidity and wind) that affect the drop size spectrum in clouds Effect of condensation level, rate of condensation, distribution of nuclei, sedimentation and turbul lence treated in detail. Conclusion is that average drop size is larger the slower the rate of cooling the higher the temperature and the lower the pressure. Number of nuclei is smallest in air over the oceans. (*Same item as* 2.2–110, Feb. 1951, *MAB.*) *Subject Headings:* **1. Drop size distributior 2. Cloud structure.**—*M.R.*

6F–44 536.421:546.221

Sato, Mizuho, **On the depression of freezing point of water due to the internal stress accompanying the transformation.** *Tokyo. Scientific Research Institute, Journal*, 44(1209):6–9, Sept. **1949** 2 refs., eqs. **DWB**—Theoretical paper, based on Carnot's cycle and Clapeyron-Clausius relation The heat of transformation is assumed to be a function of temperature. Critical temperature due to an internal stress of 2000–3280 atm. varies between −26.4°C and −33°C, dependent on what degree of approximation is used. *Subject Headings:* **1. Supercooling of water 2. Freezing point of water.**—*A.A.*

6F–45 551.578.45 551.577.53

Stranz, D., **Auslösung von Schneefall über einer Grosstadt.** [Release of snowfall over a large city.] *Zeitschrift für Meteorologie*, 3(11/12):359–360, Nov./Dec. **1949.** fig. **DLC**—On March 1, 1949 a depression brought widespread precipitation over S. Sweden and an isolated patch of snow of 5 km radius at Göteborg. This was due to a small disturbance initiated in air in adiabatic equilibrium by the heat of the town. The disturbance affected field-strength of radio microwaves. (*Same item as* 10–140, Oct. 1950, *MAB.*) *Subject Headings:* **1. Snowfall formation 2. Artificial influences 3. Microwave propagation 4. Göteborg, Sweden.**—*C.E.P.B.*

6F–46 551.576.1:551.511

Villa, Eduardo, **Diffusione del vapore nell'atmosfera. Nubi per diffusione.** [Diffusion of vapor in the atmosphere. Clouds formed by diffusion.] *Rivista di Meteorologia Aeronautica*, 9(3):21–34, July/Sept. **1949.** 2 figs., 5 refs., 11 eqs. Italian, French, English and German summaries p. 21. **MH-BH**—Molecular diffusion in the atmosphere is compared with eddy diffusion and the theories developed and applied to the problem of the evaporation of fog and the rate of growth of clouds. The laws of turbulent diffusion in the lower layers over the sea are set up graphically and applications made to show that clouds can form by means of diffusion in homogeneous stable air masses (such as mT air). (*Same item as* 4–106, April 1950 and 4B–201, Feb. 1953, *MAB.*) *Subject Headings:* **1. Cloud formation 2. Turbulent exchange 3. Turbulent diffusion.**—*M.R.*

6F–47 551.574.1:551.526(26):06

Woods Hole Oceanographic Institution, **Marine meteorology.** Contract N6onr-27702, Periodic Status Report No. 6, Jan. **1949.** 15 p. 5 figs., 4 tables, 9 refs. Mimeo. **DWB**—Presents summaries of various projects carried out at the Woods Hole Oceanographic Institution under the auspices of the Office of Naval Research. The projects are as follows: 1) the study of the transport of heat and water vapor by eddy diffusion; 2) determination of the weights of sea-salt nuclei present in the air over the sea and the variation of these nuclei with time, position and altitude. A method is presented for determining sea salt in the lower air during a tropical storm and quantitative data on the amount of sea salt in oceanic air are given. *Subject Headings:* **1. Eddy diffusion 2. Saline nuclei.**—*I.L.D.*

6F–48 551.576.1:551.594.21

Workman, Everly J. and Reynolds, S. E., **Time of rise and fall of cumulus cloud tops.** *American Meteorological Society, Bulletin*, 30(10):359–361, Dec. **1949.** fig., table, ref. **DWB**—Description and

alysis of data obtained from photography and radar measurements of convective cells or nodules ing from tops of cumulus clouds in New Mexico. It is shown that the cells subside with nearly e same speed as they rise, and that the standard deviation is small for this type of activity. (*Same m as* 3–102, March 1950, *MAB.*) *Subject Headings:* **1. Cloud structure 2. Thunderstorm ectricity.**—*M.R.*

1950

6F–49 551.576:551.591

aufm Kampe, H. J., **Visibility and liquid water content in clouds in the free atmosphere.** *ournal of Meteorology*, 7(1):54–47, Feb. **1950.** 6 figs., 15 refs., 6 eqs. **DWB, DLC**—By measuring e scattering coefficients from an airplane in different kinds of clouds (cumulus congestus, cumulus, ratocumulus, stratus and altostratus) and using Koschmieder's formula which was checked by eans of data obtained on Mt. Washington, the visibility, drop size and liquid water content of ese clouds were determined. Values ranged from 10 meters to several hundred meters for visibility om 10μ to 4μ for drop size, and from 2.5 g/m^3 for water content in the above named clouds in the spective order given. Microphotographs of droplet samples were made and one reproduced. *Same item as* 5–71, May 1950, *MAB.*) *Subject Headings:* **1. Visibility 2. Drop size distribution Water content of clouds.**—*M.R.*

6F–50 551.578.11

Bowen, E. G., **The formation of rain by coalescence.** *Australian Journal of Scientific Research, er. A, Physical Sciences*, 3(2):193–213, June **1950.** 12 figs., 2 plates, 2 tables, 16 refs., 8 eqs. **MH-BH**—The author develops a theory to explain the production of rain from clouds below the reezing level by assuming that after the initial growth of cloud droplets by condensation a small roportion of their number continues to grow by coalescence. Calculations of the rates of growth f cloud droplets by condensation and coalescence and of their trajectories through clouds are made nd it is shown that unless cloud droplets grow also by coalescence none of the droplets will grow irge enough to fall against the upward air current in order to fall as rain. The maximum height eached by the drops and the final diameter of the raindrops emerging from the base of the cloud re nearly a linear function of the vertical air velocity. The final size of the raindrops is less affected y degree of supersaturation and cloud water content. The time for rain to form is inversely proportional to the vertical air velocity. Observations on raindrop density and rain water content t different heights of nonfreezing clouds made by ground and airborne radar indicate two types of ain where characteristics correspond with deductions from the theory. The characteristics of hese rainfalls are described; the radar and radiosonde data are presented; and the conditions that nust exist in clouds before rain can form by condensation-coalescence are discussed. (*Same item as* 2.8–114, Aug. 1951, *MAB.*) *Subject Headings:* **1. Precipitation formation 2. Raindrop coalescence.** —*I.L.D.*

6F–51 551.573:551.577.11

Dady, G., **L'évaporation des goutelettes d'eau.** [Evaporation of water droplets.] *Journal Scientifique de la Météorologie*, Paris, 2(8):108 120, Oct.–Dec. **1950.** 7 figs., 3 tables, 4 refs., 26 eqs. French, English and Spanish summaries p. 108. **MH-BH**—The theory of rate of evaporation of freely falling drops of water is presented in detail. A graphical and tabular comparison of the theoretical rates as calculated from formulas of Houghton, Boussinesq and Frenkel is given and the conclusion made that Houghton's theory best fits the experimental data for all drop sizes and the Boussinesq theory holds for drops <40μ diameter. Apparatus described and illustrated. Effect of turbulence fully considered in theory. (*Same item as* 2.3–116, March 1951 and 4B–209, Feb. 1953, *MAB.*) *Subject Headings:* **1. Evaporation of raindrops 2. Atmospheric turbulence.** —*M.R.*

6F–52 551.576.1

Das, P. K., **The growth of cloud droplets by coalescence.** *Indian Journal of Meteorology and Geophysics*, 1(2):137–144, April **1950.** 5 figs., table, 5 refs., 7 eqs., append. **DWB, MH-BH**—The "collection efficiency" of large drops approaching various sizes of small drops in a cloud is calculated and presented in tables and graphs. The results show higher per cent values of accumulation than the data computed by Langmuir (*Journal of Meteorology*, 5(5), **1948**) who took into account the aerodynamic deflection of small drops ahead of a moving large drop, but not the variation in size of small drops as Das did in this study. Work based on assumption of Findeisen (*Meteorologische Zeitschrift*, 56, **1931**) and Schumann (*Royal Meteorological Society, Quarterly Journal*, 285, **1940**) that collision of cloud drops leads to coalescence, and on work of G. I. Taylor and M. Glavert on collection efficiency of aerofoils, assuming that the small drops obey Stoke's Law. (*Same item as* 7.87, July 1950, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Drop accretion.** —*M.R.*

6F–53 551.578.

Davies, D. A., **Tropical rainfall from cloud which did not extend to the freezing level.** *Meteorological Magazine*, London, 79(942):354, Dec. **1950.** table. **MH-BH**—Near Mombasa on Oct. 5 1950 rain was seen (from an airplane) falling from cumulus with tops 10,500–11,000 ft; no anvil. Temperatures at 10,500 ft—dry bulb 40°F, wet bulb 38–39. (*Same item as* 2.6–111, June 1951 *MAB.*) *Subject Headings:* **1. Rain from nonfreezing clouds 2. Cloud physics 3. Mombasa Kenya.**—*C.E.P.B.*

6F–54 551.576.1

Davies, D. R., **The lateral diffusion of a cloud of falling droplets.** *Cambridge Philosophical Society, Proceedings*, 46(3):500–507, July 1950. 3 figs., table, 2 refs., eqs. **DLC**—The author applies O. G. Sutton's theory of eddy diffusion, developed for the dispersion of gases or fine airborne suspensions from point and line sources situated near ground level, to predicting the dispersion of a cloud of falling droplets released from a point source at heights of a 1000 to 5000 ft above the earth. The mathematical theory is developed; no allowance has been made for the inertia effect, for the fact that the turbulence due to wake of the drops influences the motion of the individual drops and for evaporation from drop surfaces. Experimental and theoretical values are given for the widths of ground area covered by liquid drops released from sources situated at heights between 1000 and 5000 ft. (*Same item as* 11–127, Nov. 1950, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Drop diffusion.**—*I.L.D.*

6F 55 551.574.1

Dobson, G. M. B., **Centenary symposium on physics of clouds and precipitation. Introductory address.** (In: Royal Meteorological Society, **Centenary Proceedings, 1950.** pub. **1950.** p. 34–36. 5 refs.) **DLC**—Summary of recent work on direct deposition of ice on nuclei in supersaturated air, and chain reaction by splintering of ice. (*Same item as* 2.3–121, March 1951, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Cloud seeding 3. Cloud physics.**—*C.E.P.B.*

6F–56 551.574.1

Facy, L., **Les noyaux aritficiels de congélation.** [Artificial freezing nuclei.] *Journal Scientifique de la Météorologie*, 2(5):7–18, Jan./March **1950.** 6 figs., tables, 12 refs., eq. French, English and Spanish summaries p. 7. **DWB, MH-BH**—Nearly insoluble nuclei (such as silver iodide) and hygroscopic nuclei (such as sodium, magnesium, aluminum chlorides or lead iodide) are discussed in detail in relation to the temperature at which freezing occurs automatically (−20 to −35°C) on various sizes and concentrations of nuclei. The mechanism by which freezing occurs and the size and shape distribution of several of these kinds of minute nuclei are discussed and beautifully illustrated by means of electron-microscope photographs (figs. 1–5). (*Same item as* 7–83, July 1950, *MAB.*) *Subject Headings:* **1. Freezing nuclei 2. Hygroscopic nuclei.**—*M.R.*

6F–57 551.509.67

Gabites, J. F., **Artificial stimulation of rainfall.** *New Zealand. Meteorological Office, Circular Note*, No. 66, Nov. 13, **1950.** 6 p. 9 refs. **DWB**—Clouds whose tops have temperatures between 0°C and −10°C or −15°C normally contain supercooled liquid water droplets. The introduction of suitable sublimation nuclei such as silver iodide crystals, or the formation of ice crystals following the passage of pellets of solid carbon dioxide, results in a change from a liquid to an ice crystal cloud. In favorable conditions, large snowflakes may form and melt into raindrops, resulting in the dissipation of the cloud as a trail of precipitation, some of which may reach the ground. Nucleation with silver iodide smoke from the ground is cheap but offers little control of the time or place of the cloud seeding. If no favorable opportunities are to be lost, seeding from aircraft becomes necessary. It is estimated that the average rainfall over the Taupo Catchment could be increased by an amount of the order of one tenth of one per cent, with a value in terms of electricity of the order of £2000 per annum. The cost of the operation would probably exceed this figure several fold. (*Same item as* 5.5–75, May 1954, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Cloud seeding with silver iodide 3. Taupo Catchment, New Zealand.**—*Author's abstract.*

6F–58 551.508.765:551.574.1

Golitzine, N. (*Ottawa*), **Method for measuring the size of water droplets in clouds, fogs, and sprays.** *National Research Council of Canada, Report* No. ME-177, March 22, **1950.** 13 p.+22 photos. tables, refs. **DWB**—Photomicrographs of water drops ranging in size from 5 to 250μ are made from samples obtained on oil covered slides. Equipment, frequency data and many examples of photomicrographs appear in illustrations. Four methods of collection are described and their advantages and disadvantages cited. The one used is simplest and most effective. May be used for either fog, cloud or rain sampling. Time of exposure is critical for good results. Method of measurement described in detail. Prints are magnified about 100 times, at least 300 are measured

from each sample and the median diameter determined. (*Same item as* 4.2 25, Feb. 1953, *MAB.*) *Subject Headings:* **1. Drop size distribution measurement 2. Photomicrographs 3. Cloud physics.** —*M.R.*

6F–59 551.577.1

Houghton, Henry G., **A preliminary quantitative analysis of precipitation mechanisms.** *Journal of Meteorology*, 7(6):363–369, Dec. **1950.** 5 figs., 2 tables, 10 refs., 2 eqs. **MH-BH**—This is a quantitative study of the growth of precipitation from particles of cloud-element size to precipitation elements by the ice-crystal method and by the process of gravitational accretion. Diffusion of water vapor to ice crystals was calculated by the steady state diffusion equation of JEFFREYS. The principle of growth of drops by accretion and method for calculating rate of growth are discussed. The results of computation of rate of growth of precipitation elements by both methods are presented graphically. It is found that the ice-crystal mechanism is much more rapid than the accretion process in the early stages of growth of the precipitation elements and that the accretion process is more effective when the cloud elements have a mass of the order of magnitude of at least ten micrograms. On the basis of an analysis of the size allowed by precipitation elements it is concluded that in mid-latitude conditions rain drops are produced by the combined effect of the ice crystal and accretion processes. In low latitudes the size of the rain drops can be explained by accretion alone. (*Same item as* 2.5 141, May 1951, *MAB.*) *Subject Headings:* **1. Precipitation formation 2. Precipitation mechanism.**—*I.L.D.*

6F–60 551.574.1

Junge, Christian, **Das Wachstum der Kondensationskerne mit der relativen Feuchtigkeit.** [The growth of condensation nuclei with relative humidity.] *Annalen der Meteorologie*, 3(5/6): 129–135, **1950.** 4 figs., 2 tables, 20 refs. German and English summaries p. 129. **MH-BH**—A useful summary of the literature. Growth of nuclei and formation of haze begins with R.H. about 70% and increases rapidly above 96% (formulas quoted). In most aerosols mixed nuclei predominate. The proportion of charged to uncharged nuclei also depends on humidity. Growth curves are modified by presence of impurities, illustrated by curves for HCl. Variations of visibility below 70% are attributed to varying solubility of nuclei. Dry fogs in industrial regions are attributed to oxidation of SO_2 (following AITKEN). (*Same item as* 11–123, Nov. 1950, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Visibility.**—*C.E.P.B.*

6F–61 551.574

Köhler, Hilding, **On the problem of condensation in the atmosphere.** *Uppsala, K. Universitetet, Meteorologiska Institutionen, Meddelande*, No. 15, **1950.** 76 p. 16 figs., 10 tables, 15 refs., 49 eqs. *Nova Acta Regiae Societatis Scientiarum Upsalensis*, Ser. 4, Vol. 13, No. 9, **1950. MH-BH**—This important monograph presents systematically the kinetic and thermodynamical theory of drop formation in the free atmosphere, and is supported by numerous empirical nomograms, calculation tables and formulas based on the classical works of the author himself (who began his investigations in 1914) and of J. FRENKEL, H. WEICKMANN, MAX VOLMER, J. W. GIBBS, FOURNIER D'ALBE and FINDEISEN. Among other subjects treated are: historical development of present theory; GIBBS' investigations to show how droplets can form without condensation nuclei; the probability of formation of a droplet; computation of equilibrium curves; (a) equilibrium and (b) energy necessary for formation of a droplet (1) without and (2) with a condensation nucleus, respectively; equilibrium conditions for a system of droplets and vapor; nonhygroscopic condensation nuclei; the kinetics of condensation; supercooling; the equilibrium curve of droplets of pure water and of sea salt solutions, respectively; numerical calculations (including curves and tables) of number of condensation nuclei N, vapor pressure, concentration of droplets, energy relations, mass and density of nuclei and droplets, etc. Application to formation of ground fog and to a lesser extent of clouds and ice. Appendix I, contains detailed data on: (1) density of sea water, (2) of water in solution and (3) surface tension; Appendix II, computation of $A_{s(mi)}$ and Appendix III, computation of M_s and I. (*Same item as* 10–118, Oct. 1950, *MAB.*) *Subject Headings:* **1. Condensation 2. Cloud physics 3. Condensation nuclei.**—*M.R.*

6F–62 551.574.1:016

Kramer, Harris P. and Rigby, Malcolm, **Selective annotated bibliography on cloud physics and "rain making."** *Meteorological Abstracts and Bibliography*, Boston, 1(3):174–205, March **1950.** 204 refs. **DLC.** Also: Harris, D. Lee, **A short bibliography on artificial production of precipitation.** U. S. Weather Bureau, June 1, **1950;** rev. Feb. 18, **1952.** 6 p. **DWB**—The first bibliography contains 204 annotated references to literature on: I. Physics of precipitation formation and condensation, and II. Artificial modification of clouds. Items are arranged chronologically within each section. The various aspects of these two subjects are indicated in an outline. The second bibli-

ography lists 58 items to supplement the above special bibliography on cloud physics and rain making. *Subject Heading:* **1. Bibliography on cloud physics.**—*M.L.R.*

6F–63 551.574.1

Krastanow, L., **Über eine Grundfrage bei den Kondensationsvorgängen in der Atmosphäre.** [A basic problem on condensation processes in the atmosphere.] *Bulgarska Akademiia na Naukilie Sofia, Doklady*, 3(1):13–16, Jan./March **1950.** refs., eqs. **DWB**—A theoretical development for determination of the rate of formation and energy released in formation of a drop of water on a condensation nucleus, based on formula of BECKER and DORING (1935) where it was assumed that nuclei were completely wettable. The author maintains that with different saturation or super saturation values, different degrees of wettability exist for a given nucleus. (*Same item as* 3.5–233 May 1952, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Supersaturation 3. Drop formation.**—*M.R.*

6F–64 551.594.21:551.577:551.576

Küttner, Joachim, **Die elektrischen und meteorologischen Vorgänge in der Basis von Gewitterwolken.** [Electrical and meteorological processes in thundercloud bases.] (In: Israel, H. and others: **Das Gewitter.** Leipzig, **1950.** p. 179–183. 3 figs.) *Probleme der Kosmischen Physik* v. 25. **MH-BH**—Results of measurements made at Zugspitze Observatory (1945–1948) during 125 thunderstorms are reported. Details on the distribution of types of precipitation, on precipitation electricity, on the fine structure of solid precipitation, on cirrus anvils, on the height of cloud base and on the water content of thunderclouds are among the factors discussed. A more detailed report on the same research was published in English in the **Journal of Meteorology,** Oct. 1950 (*See item* 2.3–170, March 1951, *MAB.*) *Subject Headings:* **1. Thunderstorm electricity 2. Thunderstorm rainfall 3. Thunderclouds 4. Zugspitze, Germany.**—*G.T.*

6F–65 551.574.42

Lafargue, Camille, **Sur la congélation des gouttelettes d'eau à l'air et à l'abri de l'air.** [On the freezing of water droplets in the atmosphere or under cover.] *Académie des Sciences, Paris, Comptes Rendus*, 230(12):1194–1195, March 20, **1950.** 2 refs. **DWB**—Experiments were conducted on the freezing point of pure water and of different solutions of salts on wire meshes of different sizes. It was found that freezing occurs automatically at about −41°C, regardless of salinity and, hence, the freezing does not depend on condensation nuclei in the atmosphere. (*Same item as* 2.9–126, Sept. 1951, *MAB.*) *Subject Headings:* **1. Freezing point of water 2. Cloud physics 3. Condensation nuclei.**—*M.R.*

6F–66 551.509.67

Lewis, William, **The importance of artificial nucleation for the production of precipitation.** *New York Academy of Sciences, Transactions*, 2nd Ser., 12(8):264–267, June **1950. DLC**—The author criticizes the theory upon which is based the belief of the importance of artificial nucleation for producing rainfall. On the basis of a study of the formation of "altostratus" and "cumulonimbus" clouds he concludes that the existence of circulation patterns facilitating sufficient lifting for the production of precipitation will bring about a natural formation of ice crystals and the release of available moisture. (*Same item as* 3.3–78, March 1952, *MAB.*) *Subject Headings:* **1. Artificial precipitation 2. Condensation nuclei.**—*I.L.D.*

6F–67 551.576.11:551.574.1

Ludlam, F. H. and Wexler, R., **The growth of ice particles in cumulonimbus.** *Weather*, 5(7):262, July **1950.** 2 refs. **DWB.** Also translation into Czech under title: **Růst ledových částic v kumulonimbech,** in *Meteorologické Zprávy*, 4(5/6):129, **1950. MH-BH**—Hail and heavy rain due to rare ice nuclei effective at −5°C. (*Same items as* 11–124, Nov. 1950, and 3.8–144, Aug. 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Cumulonimbus clouds 3. Condensation nuclei 4. Reviews.**—*C.E.P.B.*

6F–68 551.574.1

Miyata, Y., **On the deformation of colliding water drops (I).** *Meteorological Society of Japan, Journal, 2nd Ser.*, 28(2):71–75, Feb. **1950.** 2 figs., 2 refs., 17 eqs. In English; Japanese summary p. 75–76. **DWB**—Author calculates the differential equation of the distorted surface of two water drops of different sizes approaching directly, and obtains a definite solution. (*Same item as* 2.4–124, April 1951, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Cloud physics.**—*C.E.P.B.*

6F–69 551.576:551.574.7:551.506

Mt. Washington Observatory, **Contributions to the theory of the constitution of clouds.** Contract AF 28(099)-25, Research Report, Final Report, July 31, **1950.** 44 p. figs., tables, refs., eqs.

DWB, MH-BH—A comprehensive summary of studies made on the theory of cloud constitution and meteorological factors affecting icing. The latter section discusses the liquid water content of clouds as related to three basic cyclone types and to cold fronts, and the mean effective drop diameter as related to cyclone position and type, and to trajectory of surface air masses. Then a method is developed for correcting temperature at summit of Mt. Washington for cooling due to forced ascent of air over the mountain. Finally, the drop size distribution in fog is subject to critical statistical tests to determine the best method of presentation of data. (*Same item as* 2K 264, Nov. 1951, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Icing conditions 3. Synoptic studies 4. Mount Washington, New Hampshire.**—*M.R.*

6F–70 551.515.4 551.574.1

Mull, S. and Rao, Y. P., **Dynamics of thunderstorms. Pts. I and II.** *Indian Journal of Meteorology and Geophysics*, 1(2):116–136, April **1950; 1**(4):291–297, Oct. **1950.** 12 figs., 2 tables, 18 refs., 13 eqs. **DWB**—In Pt. I a number of classical hypotheses as to the cause of pressure changes accompanying various types of thunderstorms are discussed theoretically and in the light of actual records. In Pt. II a mechanism is discussed and illustrated whereby sudden cooling is produced in a cumulus congestus, thus initiating a downdraft which converts the cumulus into a cumulonimbus. Raindrops or hailstones are not essential for this cooling process, but water in a liquid and solid phase must coincide with level of supercooling so that much liquid water is present when sudden melting of ice crystals and congelation of supercooled water takes place. (For separate abstracts on Pt. I and II *see items* 11–78 and 2.3–78, Nov. 1950 and March 1951, *MAB.*) *Subject Headings:* **1. Thunderstorm dynamics 2. Cloud physics.**—*M.R.*

6F–71 551.574.1:551.576.1

Ogiwara, Sekiji, **On the solid condensation nucleus which is not soluble in water. (Studies on the formation of cloud and rain, III.)** *Tohoku University, Science Reports, 5th Ser., Geophysics*, 2(3):158–162, Dec. **1950.** 4 figs., 2 tables, 4 refs., 8 eqs. **DWB**—A thermodynamical investigation of the water film formed on a nonhygroscopic nucleus, along with a study of the role of solid nuclei in the condensation process. It is shown that a solid nucleus can also act as a concensation nucleus in the atmosphere. (*Same item as* 4.4–187, April 1953, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Cloud physics 3. Nonhygroscopic nuclei.**—*W.N.*

6F–72 551.574.1:551.576.1

Ouchi, Koo, **On the stability of the ice germs in a cloud (fog) particle.** *Tohoku University, Science Reports, 5th Ser., Geophysics*, 2(3):163–166, Dec. **1950.** 2 tables, 20 eqs. **DWB**—A mathematical study on the subject. This author defines "ice germ" as: "pure ice crystal or the ice-affine (freezing) nucleus covered with thin ice film." Temperature of equilibrium of three phases lies within 0°C to −0.2°C, hence existing ice nuclei (radii larger than 10^{-3} cm) can grow—the cloud particles freeze—into spheres if the cooling rate is large. If no ice nuclei $>10^{-6}$ cm exist in a cloud, supercooling can easily occur. *Subject Headings:* **1. Condensation nuclei 2. Cloud formation 3. Freezing nuclei 4. Ice nuclei.**—*W.N.*

6F–73 551.574.1:551.576

†Perrie, D. W., **Cloud physics.** New York, John Wiley and Sons, **1950.** 119 p. 7 figs., 30 plates, 3 tables, glossary, biblio. p. 109–114 **DWB**—An excellently illustrated and readable book on many aspects of cloud forms, cloud formation and cloud physics. Chapters on condensation and sublimation nuclei, natural and artificial precipitation, cloud observation and forecasting, effects of clouds on aviation, optical and electrical phenomena associated with clouds, and clouds in the stratosphere (noctilucent and nacreous clouds) are none too technical for the ordinary layman to understand. There is a good guide to cloud identification and an unannotated bibliography of over 100 references. (*Same item as* 2.5–125, May 1951, *MAB.*) *Subject Headings:* **1. Cloud formation 2. Cloud classification 3. Cloud physics.**—*M.R.*

6F–74 551.574.1

Pollermann, M., **Die Tröpfchenbildung an Ionen in der Wilsonschen Nebelkammer.** [Formation of droplets on ions in the Wilson condensation chamber.] *Annalen der Physik*, 6 Ser., 5(6–8): 329–348, **1950.** 24 figs. **DWB**—During expansion of a Wilson chamber, electrical mobility of ions was continuously measured and occurrence of spontaneous droplet formation followed. The mobility of ions and critical supersaturation for positive ions agreed with Volmer's theory. Greatest supersaturation reached did not cause condensation on negative ions. (*Same item as* 7–85, July 1950, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Drop formation.**—*C.E.P.B.*

6F–75 551.574.1

Sinclair, David (*Johns-Manville Res. Center, Manville, N. J.*), **Physical properties of aerosols.** *U. S. Technical Conference on Air Pollution, Wash., D. C., 1950, Air Pollution.* **1950.** p. 169–181.

6 figs., tables, refs., 14 eqs. **DLC**—The author discusses theoretically the internal stability o aerosols and the use of light scattering as a means to measure particles, particle size in aerosols and hydrosols. With regards to the former he considers Brownian movement and gravity settling, and equations for the average displacement of a spherical particle in a given direction and for coagulation and settling rates are given; with regard to the latter, the equation for total scattering and angular distribution are presented. *Subject Headings:* **1. Aerosols 2. Aerosol measurement.**—*I.L.D.*

6F–76 551.576:551.574.1(02

†Süring, Reinhard, **Die Wolken.** [The clouds.] *Probleme der kosmischen Physik*, Vol. 16 **1950.** 153 p. photos, diagrs., numerous refs. **MH-BH**—The first edition of this classical treatise was compiled in 1935 and the second edition just before the war. This third edition, which was prepared for publication in May 1949 just before the death of the author, is essentially a review of German literature and knowledge of clouds, cloud forms and cloud physics superimposed on the work of the IMO, such as the International Cloud Atlas. The chapters on peculiar cloud forms (luminous night clouds, mother-of-pearl clouds, twilight cirrus, mammatus formations, orographic clouds artificial clouds, condensation trails, etc.) and on cloud physics, including optical and electrical phenomena, on relation to radiation, on height and movement of clouds, on daily, annual and regional variations and frequencies, and on observation and photography of clouds are especially interesting. Each chapter contains an extensive bibliography, arranged by subjects. Most of the literature cited is of German origin. (*Same item as* 3.2–137, Feb. 1952, *MAB.*) *Subject Headings:* **1. Clouds 2. Cloud physics 3. Bibliographies 4. Textbooks.**—*M.R.*

6F–77 551.576.11:551.571.7

Tsuji, M., **On the saturated vapour pressure over small drops of aqueous solution.** *Geophysical Magazine*, Tokyo, 22(1):15–20, Oct. **1950.** 2 figs., 7 refs., 9 eqs. In English. **MH-BH**—Saturated vapor pressure over water increases with curvature of the surface and decreases with salinity or electric charge in the drop. The relation between radius of drop and vapor pressure over the drop is calculated and shown graphically. Relation of relative humidity to amount of NaCl in solution shown by a series of curves for various drop sizes. (*Same item as* 2.3–129, March 1951, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Saturation over drops 3. Cloud physics.**—*M.R.*

6F–78 551.577.11:551.576:551.509.67

Vierhout, R. R., **On the formation of rain in clouds not reaching up to the freezing level.** *Journal of Meteorology*, 7(3):223–226, June **1950.** 3 refs., 8 eqs. **DWB, MH-BH**—Computations made by the author indicate that Langmuir's chain reaction theory for precipitation formation in clouds seeded over Hawaii is not sufficient. An alternate explanation that falling dry ice pellets produce evaporation and resulting disturbances leading to coalescence is presented and suggested as mechanism whereby rain forms in the subtropics at levels below the zero isotherm. (*Same item as* 8–94, Aug. 1950, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Cloud seeding 3. Langmuir's theory. 4. Precipitation formation.**—*M.R.*

6F–79 551.574.1:551.578.41

Weickmann, Helmut, **Biologie der Schneekristalle.** [Biology of snow crystals.] *Umschau*, Frankfurt a.M., 50(4):116–119, Feb. **1950.** 12 figs. **DLC**—Conditions effecting various forms of the growth of ice crystals are examined. The dependence on temperature of basic types of ice crystals is presented in a graph. Twelve pictures of crystals and replicas are presented. (*Same item as* 3.8–139, Aug. 1952, *MAB.*) *Subject Heading:* **1. Ice crystal formation.**—*G.T.*

6F–80 551.574.1:551.578.41:551.576.11

Weickmann, H., **Die festen Wolkenelemente.** [The solid cloud particles.] (In: Israel, H. and others: **Das Gewitter.** Leipzig, **1950.** p. 151–179. 11 figs., table, 36 refs.) *Probleme der Kosmischen Physik*, v. 25. **MH-BH**—The inner structures of ice crystals and the physical processes involved in atmospheric ice crystal formation are discussed. Ice crystals collected in various types of clouds (such as convective cirrus, cirrostratus, condensation trails, moazagotl clouds and cumulonimbus anvils) are described and depicted in microphotographs. The different mechanisms of ice crystal growth and corresponding crystal forms are discussed. *Subject Headings:* **1. Ice crystal forms 2. Ice crystal growth.**—*G.T.*

6F–81 551.576.11

Zaĭtsev, V. A., **Vodnost' i raspredelenie kapel' v kuchevykh oblakakh.** [Water content and distribution of drops in cumulus clouds.] *Leningrad, Glavnaia Geofizicheskaia Observatoriia, Trudy*, 19(81):122–132, **1950.** 7 figs., 2 tables, 6 refs. **DLC**—The results of 50 airplane flights through cumulus clouds, 360 measurements of water content and 600 microphotographs of drops are given. Diagrams are presented to show the distribution of water content in various cumulus clouds. The

umulus congestus shows maximum content near the center of the upper part of the cloud. Drops ecome larger and number of drops smaller as you go from the base to the top. For purpose of nalysis, each cloud is divided into 4 zones and the properties of drops and water content are discussed nd illustrated for each zone. Methods of observation are described. (*Same item as* 2.8–107, ug. 1951, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Water content of clouds 3. U.S.S.R.** —*M.R.*

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6F–82 551.575.1:551.574.1:551.509.67

†Amelin, A. G., **Teoreticheskie osnovy obrazovaniia tumana v khimicheskikh proizvodstvakh.** [Theoretical bases of fog formation during chemical processes.] Moscow, Goskhimizdat., **1951.** 69 p. 41 figs., 29 tables, 90 refs., eqs. **DLC**—Although intended for chemists or laboratory workers in the physical sciences or industry, this book contains many chapters of interest to meteorologists working in the field of cloud physics. The first chapter takes up fog formation by condensation (supersaturation, critical limits for saturation in the presence and absence of ions or nuclei, dependence on temperature, amount of liquid fog, examples of supersaturation). Ch. 2 is concerned with the formation of fog by adiabatic expansion (including radiation fog formation); Ch. 3 on fog formation by mixing; Ch. 4 by chemical reactions and Ch. 5 on relation of fog formation to condensation of vapor on various surfaces (including artificial formation with use of solid CO_2, by SCHAEFER). In the last chapter (6), on mechanical formation of fog, there are discussions of quantitative experiments on drop size distribution and evaporation of drops in fogs. (*Same item as* 5.10–1, Oct. 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Fog formation 3. Artificial fog 4. Condensation nuclei 5. Drop size distribution.**—*M.R.*

6F–83 551.574.1:06

American Geophysical Union. Committee on Cloud Physics, **Report, 1951.** *American Geophysical Union, Transactions,* 32(5):760–764, Oct. **1951.** refs. **DWB**—Recent publications on cloud physics and artificial precipitation are reviewed. The section on artificial nucleation includes seven papers by authors such as ANDERSON, VONNEGUT, LANGMUIR, SCHAEFER, HOUGHTON and others. Section on research concerned with Bergeron-Findeisen ice particle theory and source of ice particles in supercooled clouds includes works by BOWEN, HOUGHTON, LUDLAM, LEVINE, WORKMAN, REISS, WOODCOCK, KÖHLER, and others. (*Same item as* 3.9–182, Aug. 1952, *MAB.*) *Subject Headings:* **1. Cloud physics research 2. Artificial precipitation.**—*G.T.*

6F–84 551.574.1:551.524

aufm Kampe, Hans Joachim, Weickmann, Helmut K. and Kelly, J. J., **The influence of temperature on the shape of ice crystals growing at water saturation.** *Journal of Meteorology,* 8(3): 168–174, June **1951.** 17 figs., 11 refs. **DWB**—The effect of temperature upon the shape of ice crystals is studied experimentally in a room-size cold chamber. The room atmosphere is seeded with either dry ice, silver iodide, etc., at temperatures above −20°C; no seeding was done below this temperature. Down to a temperature of −4°C single plate crystals are formed, between −4° and −9°C short prisms and twin plates are formed. Various changes occur in shape of crystals at lower temperatures; at −20°C columnar crystals appear. Observations of halos in ice crystal clouds are described. (*Same item as* 3.5–231, May 1952, *MAB.*) *Subject Headings:* **1. Ice crystal formation 2. Air temperatures 3. Halos.**—*I.L.D.*

6F–85 551.574.1 551.5(02)

aufm Kampe, H. J., **Das Wetter und seine Ursachen; neuere Erkenntnisse vom Wettergeschehen.** [Weather and its causes; recent knowledge on weather processes.] Darmstadt, Dietrich Steinkopff, **1951.** 164 p. photos., graphs, charts, 82 refs. **MH-BH**—Chs. 9 and 10 (p. 137–153) contain a brief summary of knowledge on condensation, sublimation and freezing nuclei, kinetics of phase transition in water, the effect of vertical velocities of ice cloud formation, ice cloud particles, and artificial cloud modification. Microphotographs of ice crystals from various types of clouds are included. (For fuller abstract *see item* 3.5–1, May 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Cloud seeding 3. Textbooks.**—*G.T.*

6F–86 551.574.1

Bergeron, Tor, **General survey in the field of cloud physics.** *International Union of Geodesy and Geophysics. Association of Meteorology, 9th, Brussels, Aug. 1951, Assemblée General,* [*Mémoires et Discussion*], p. 120–134. 2 figs., refs. Its *AIM* No. 9/c. Also issued as: *Uppsala. K Universitetet. Meteorologiska Institutionen, Meddelande,* No. 39. Abstracted from reprint. **DWB**—Presents a brief review of the development of the study of cloud physics during the past 30 years. Author cites the work of J. BJERKNES and H. SOLBERG on the meteorological conditions for the formation of rain, the genetic classification of clouds by BERGERON, the contributions of C. F.

BROOKS and of FINDEISEN, the Thunderstorm Project, and studies of lenticular clouds. A table gives an outline of cloud and precipitation mechanisms and an illustration showing a three dimensional model of the main middle latitude front disturbances and clear weather regions (autumn) are presented. *Subject Headings:* **1. Cloud physics 2. Rain formation 3. Cloud classification.** —*I.L.D.*

6F–87 551.574.1

Best, A. C., **Drop-size distribution in cloud and fog.** *Royal Meteorological Society, Quarterly Journal*, 77(333):418–426, July **1951.** fig., 2 tables, 8 refs., 10 eqs. **MH-BH**—Data on drop size distribution in cloud and fog are summarized and each group fitted logarithmically to expression $1-F=\exp.[-(x/a)^n]$ (cf. BEST's expression for raindrop sizes) where F is fraction of liquid water comprised in drops with diameter less than x; n is an index with an average value of 3.27. An appendix describes computation of average size of cloud crops. (*Same item as* 2.10–127, Oct. 1951, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Drop size distribution.**—*C.E.P.B.*

6F–88 551.574.1

Best, A. C., **The size of cloud droplets in layer-type clouds.** *Royal Meteorological Society, Quarterly Journal*, 77(332):241–248, April **1951.** 6 tables, 10 refs. **MH-BH**—The maximum size of droplets on salt nuclei, time required to grow from radius 0.75μ to 50μ, corresponding fall distance and average radius in a cloud are calculated, assuming various sized nuclei, temperatures and degrees of supersaturation. Rate of growth is compared with that calculated by HOWELL. The calculated radii reached before droplet is removed from the cloud by turbulent diffusion or gravity agree well enough with the results of observation. (*Same item as* 2.6–93, June 1951 and 3F–132, June 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Drop size distribution.**—*C.E.P.B.*

6F–89 551.578.11

Blanchard, Duncan C., **The distribution of raindrops in natural rain.** General Electric Research Laboratory, Schenectady, Contract DA-36-039-sc-15345, Project Cirrus, Final Report, July 30, **1951.** p. 81–93. 6 figs., 2 tables, 6 refs., eq. **DWB**—A report on experiments made at Schenectady, N. Y., in 1949 for determining size and distribution of raindrops in natural rainfall, including some of their results and conclusions. The experiments were based on the Bentley flour technique. The size of raindrops was calculated from the volume of flour pellets. (*Same item as* 3.3–197, March 1952, *MAB.*) *Subject Headings:* **1. Raindrop size distribution 2. Bentley flour pellet technique.**—*G.T.*

6F–90 551.578.11:551.508.765

Blanchard, Duncan C., **The use of sooted screens for determining raindrop size and distribution.** General Electric Research Laboratory, Schenectady, Contract DA-36-039-sc-15345, Project Cirrus, Final Report, July 30, **1951.** p. 94–101. 3 figs., 2 refs. **DWB**—According to this report, the use of a mesh screen sooted with a thin layer of carbon will eliminate a disadvantage (effect of wind) of the Bentley flour technique in determining size and distribution of raindrops. The drops were found to pass through the screen with a negligible amount of spattering and the actual sizes of the drops were determined by applying a curve representing the relation between the mark left and the raindrop. The screen was also used in flight. (*Same item as* 3.3–198, March 1952, *MAB.*) *Subject Headings:* **1. Raindrop size distribution measurement 2. Sooted screen technique.**—*G.T.*

6F–91 551.578.41

Blanchard, Duncan C., **A verification of the Bally-Dorsey theory of spicule formation of sleet pellets.** *Journal of Meteorology*, 8(4):268–269, Aug. **1951.** 2 figs., 7 refs., 4 eqs. **MH-BH**—It is calculated that a falling drop of freezing rain would take 200 sec to collect enough water to form a spicule (such as is illustrated) by vapor condensation, as was formerly thought to be the cause. The shorter, actual observed time of 6 sec would demand another explanation such as that pressure on the unfrozen water in the interior of the drop forces water through a weak spot in the freezing shell, and later through a freezing tube which grows rapidly. The latter theory suggested by N. E. DORSEY (1938) and BALLY (1935) seems to be verified by laboratory experiments measuring temperature, volume and rate of growth. (*Same item as* 3.6–147, June 1952, *MAB.*) *Subject Headings:* **1. Sleet pellets 2. Spicule formation 3. Freezing of water. I. Bally, O. II. Dorsey, N. E.**—*M.R.*

6F–92 551.574.1:551.508.91

Boston University. Dept. of Chemistry, **Physical chemical factors involved in atmospheric phase transitions.** Contract AF 19(122)-168, Reports Nos. 1–5, March 15, 1950–March 15, **1951.** 5 pieces. tables, refs., eqs. **DWB**—During the project's initial phase covered by these first five reports, laboratory equipment was installed and improved and some theoretical studies completed. The theoretical papers **Time lag in the nucleation of supercooled water clouds by silver iodide smokes, The kinetics of phase transitions in binary systems,** and **The growth of uniform colloidal**

dispersions are contained in Reports 1 and 4. An investigation of AgI particles as condensation nuclei, made with the use of a condenser, is described in Report 2. Reports 3 and 5 give detailed descriptions and illustrations of the cloud chamber and attached equipment installed in the project laboratory. HOWARD REISS is in charge of both theoretical and experimental work. *Subject Headings:* **1. Nucleation 2. Cloud physics research 3. Artificial precipitation 4. Cloud chambers. I. Reiss, Howard II. Saltsburg, Howard.**—*G.T.*

6F–93 551.508.765 551.578.11

Bowen, E. G. and Davidson, K. A., **A raindrop spectrograph.** *Royal Meteorological Society, Quarterly Journal*, 77(333):445–449. July **1951.** 6 figs., 5 refs. **MH-BH**—Describes a raindrop spectrograph in which drops fall through a wind tunnel on to a moving strip of sensitized paper. It was calibrated to give raindrop diameter in terms of deflection. Some interesting records are shown. (*Same item as* 2.10–34, Oct. 1951, *MAB.*) *Subject Headings:* **1. Spectrographs 2. Raindrop size measurement.**—*C.E.P.B.*

6F–94 536.421:546.212

†Brewer, Alan W. and Palmer, H. P., **Freezing of supercooled water.** *Physical Society, Proceedings, Ser. B*, 64:765–773, **1951.** 7 figs., 13 refs. **FWB**—Describes an unsuccessful attempt to reproduce the result of W. RAU (1944) that by repeated freezing and thawing, freezing point of water can be reduced to −72°C. Authors find that a freezing nucleus in pure water remains fully effective after freezing and thawing 500 times in 24 hours, and conclude that Rau's phenomena were due to strong contamination with alcohol from his apparatus. *Subject Headings:* **1. Freezing of water 2. Freezing point of water.**—*C.E.P.B.*

6F–95 551.508.765

*Brun, Rinaldo; Levine, Joseph and Kleinknecht, Kenneth S., **An instrument employing a coronal discharge for the determination of droplet-size distribution in clouds.** *U. S. NACA, Technical Note*, 2458, Sept. **1951.** 53 p. photos, diagrs., graphs, tables, refs., eqs. **DWB**—A flight instrument that uses electric means for obtaining a measure of the droplet-size distribution in above-freezing clouds has been devised and given preliminary evaluation in flight. An electric charge is placed on the droplets and they are separated aerodynamically according to their mass. The desirable features of an instrument based on the method described are: 1) the instrument can be used in clouds with temperatures above freezing, 2) the size and the shape of the cylinders do not change during the exposure time, 3) the error caused by bounce-off is low, 4) the readings are instantaneous and continuous and 5) the fast instrument response permits the study of variations in cloud structure. (*Same item as* 3.2–39, Feb. 1952, *MAB.*) *Subject Headings:* **1. Drop size distribution instruments 2. Cloud physics.**—*Authors' abstract.*

6F–96 551.571.1:551.574.1

Carnegie Institute of Technology. Metals Research Laboratory, **Kinetics of nucleation in atmospheric phase transitions.** Contract AF 19(122)-185 [Research] Reports, No. 5–7, Sept. 1, Oct. 1, Dec. 1, **1951.** 3 pieces. fig., diagr. (fold.), table, refs., eqs. **DWB**—Measurements have been made of supersaturation critical for the homogeneous nucleation of water droplets and ice crystals from the vapor phase as a function of temperature. Instrumentation and methods of measurement are described and some results reported. Evidence indicates that at −63°C there is a change in the mechanism of nucleus formation and that it is impossible to form ice crystals by freezing drops in absence of foreign nuclei. (For fuller abstract on Reports 5 and 6 *see item* 6.3–203, March 1955, *MAB.*) *Subject Headings:* **1. Supersaturation 2. Ice crystal formation 3. Nucleation. I. Pound, G. M. II. Madonna, L. A. III. Sciulli, Charles IV. Greenberg, David V. Birchenall, C. E. VI. Yang, Ling.**—*A.A., M.R., G.T.*

6F–97 551.594.25:551.578.11

Chalmers, J. Alan, **The origin of the electric charge on rain.** *Royal Meteorological Society, Quarterly Journal*, 77(332):249–259, April **1951.** 4 figs., table, refs., 16 equations. **MH-BH**—Sets out a quantitative theory of the observed electric charge on rain on the basis that the field giving rise to the point discharge is first set up and the raindrops are charged by the ions from the point discharge. On reasonable assumptions this is quantitatively possible. The best fit is given by zero potential gradient at about 800 meters and an effective separation of discharge points by 6–14 m. It is suggested that precipitation remains solid, on the average, down to 800 m and separation of + and − charges operates down to this level. It usually gives − charge on falling drops but can give +. (*Same item as* 2.6–150, June 1951, *MAB.*) *Subject Headings:* **1. Electrical charges on raindrops 2. Cloud physics.**—*C.E.P.B.*

6F–98 551.576.11:551.524:551.507.352

Chestnaia, I. I., **Izmenenie temperatury i vlazhnosti vozdukha pri perekhode iz kuchevogo oblaka v okruzhaiushchuiu ego atmosferu.** [Changes in the temperature and humidity of air during its passage from a cumulus cloud into the atmosphere surrounding it.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 25(86):5–19, **1951.** 7 figs., 3 tables, 5 refs., eqs. **DLC**—Measurements of temperature and humidity within cumulus clouds and in the surrounding atmosphere were made during airplane flights carried out in the summers of 1946–1948. It was found that the difference in temperature within a cloud and outside of it depends on the height above the cloud base, the humidity of surroundings of the cloud, the stage of the cloud and the presence of vertical currents. Relative humidity is difficult to measure because of inertia of the hygrometer. The reliability of the hygrometer and methods for eliminating errors are discussed. (*Same item as* 3.8–142, Aug. 1952 *MAB.*) *Subject Headings:* **1. Cloud observations 2. Cumulus cloud temperatures 3. Relative humidity measurement 4. Airplane observations 5. Cloud height 6. Vertical currents 7. Hygrometers.**—*I.L.D.*

6F–99 551.578.11 551.576.1 551.574.1

Cloud physics. *Royal Meteorological Society, Quarterly Journal*, 77(334):682–686, Oct. **1951.** table. **MH-BH**—A discussion of papers by A. C. Best (*see item* 6F–88), F. H. Ludlam (*see item* 6F–127) and R. S. Scorer (*see item* 2.6–98, June 1951, *MAB*). *Subject Heading:* **1. Cloud physics.**—*C.E.P.B.*

6F–100 551.508.765:551.574.1:551.508.82

Cooper, B. F., (*Sydney, Australia*), **Balloon borne instrument for telemetering raindrop-size distribution and rainwater content of clouds.** *Australian Journal of Applied Science*, 2(1):43–55, **1951.** diagr., graphs, photos., refs. Abstracted from reprint. **DWB**—An instrument is described and illustrated which gives quantitative information on raindrop size and water content per unit volume of cloud. The device is carried by a radiosonde type balloon and the data are transmitted to the ground by radio. The force of impact of a drop on the microphone at the transmitter indicates size of drop, the frequency of impulses gives the count, and the impulses received are sorted automatically into amplitude groups to give the drop size distribution. A check on total liquid water content is obtained by a separate catching funnel which allows drops of uniform and known size to fall on a similar microphone, thus integrating along with the larger drops the water caught from drops of <.5 mm diameter which cannot usually be detected due to static. Besides data on construction, circuits, calibration and accuracy, actual records are given. (*Same item as* 3.11–62, Nov. 1952, *MAB.*) *Subject Headings:* **1. Raindrop size distribution meters 2. Drop size meters 3. Liquid water content of clouds 4. Radiosondes 5. Cloud physics.**—*M.R.*

6F–101 551.574.1

Dingle, A. N. and Nexsen, W. E., Jr., **Observation of the freezing of droplets in ion tracks.** *Journal of Meteorology*, 8(5):365 366, Oct. **1951.** 2 refs. **MH-BH**—In a cloud chamber with a water reservoir above a pool of cold alcohol, ion tracks scintillated, indicating freezing of water droplets at temperatures of −40° to −45°C. (*Same item as* 3.4–186, April, 1952, *MAB.*) *Subject Heading:* **1. Freezing nuclei.**—*C.E.P.B.*

6F–102 551.574.1:537.531

Dorsch, Robert G. and Boyd, Bemrose, **X-ray diffraction study of the internal structure of supercooled water.** *U. S. NACA, Technical Note*, 2532, Oct. **1951.** 14 p. diagr., graph, photo, refs. **DWB**—X-ray diffraction data for water in the temperature range 21° to −16°C are presented. The minimum between the two main diffraction peaks deepened continuously, as the temperature was lowered. It is concluded that supercooled water apparently becomes progressively more ice-like in structure as the temperature is lowered. (*Same item as* 3.8–136, Aug. 1952, *MAB.*) *Subject Headings:* **1. Supercooled water 2. X-ray diffraction data for water 3. Ice formation.**—*Authors' abstract.*

6F–103 551.571.1:551.574.1

Dufour, Louis, **De oppervlaktespanning van een wolkendruppel.** [The surface tension of a cloud droplet.] (*K.*) *Vlaamsche Academie voor Wetenschappen, Lettern en Schoone Kunsten van Belgie. Klasse der Wettenschappen, Mededeelingen*, 13(14), **1951.** 12 p. refs., 25 eqs. In Flemish; French summary p. 11–12. **DLC**—Theoretical study based on Gibb's formula for the increase in surface tension, dependent on thermal, mechanical and chemical processes in a droplet of a saline solution. (*Same item as* 5.4–172, April 1954, *MAB.*) *Subject Headings:* **1. Cloud droplets 2. Surface tension of droplets.**—*A.A.*

6F–104 551.511:551.574.1

Dufour, L. (*Uccle, Belgium*), **Sur la thermodynamique de la condensation dans l'atmosphère.** [Thermodynamics of condensation in the atmosphere.] *Belgium. Institut Royal Météorologique, Mémoires*, v. 42, **1951.** 39 p. eqs. **DWB**—In this purely theoretical monograph, the author attempts to develop in a systematic manner the thermodynamic equations used in studying condensation processes in the atmosphere, following the method developed by R. Defay in his work on thermodynamics of surface tension (1934). It is assumed (after Gibbs) that the properties of the gas or water are constant or homogeneous up to the point of contact of the two phases and that the surface of separation is geometric. After setting up the basic equations, the author treats of the Clausius, Kirchhoff and Kelvin-DeDonder relations, and the conditions of mechanical equilibrium, the superficial phase, the states of equilibrium, and some applications to the study of evaporation and cloud physics. (*Same item as* 3.10–107, Oct. 1952, *MAB.*) *Subject Headings:* **1. Thermodynamics of condensation 2. Cloud physics.**—*M.R.*

6F–105 551.574.1

Farley, F. J. M. (*Cavendish Lab., Cambridge Univ.*), **Clouds produced in an expansion chamber by ultra-violet light.** *Royal Society of London, Proceedings, Ser. A*, 207(1091):527–539, July 23, **1951.** 5 figs., 2 tables, 7 refs. **DLC**—Clouds are produced in an expansion chamber filled with air and water vapor by irradiating with ultra-violet light through a quartz window, and expanding shortly afterwards. It is shown that the condensation does not occur upon charged particles, but on certain electrically neutral nuclei, not yet identified. By varying the wave-length of the ultra-violet light it is shown that the condensation is initiated by atomic oxygen, liberated by the action of the radiation on oxygen molecules. Similar effects are produced when an intense beam of deuterons is passed into the chamber. *Subject Headings:* **1. Artificial clouds 2. Cloud chambers 3. Cloud physics.**—*Author's abstract.*

6F–106 551.574.1 551.508.765

Frith, Ronald, **The size of cloud particles in stratocumulus cloud.** *Royal Meteorological Society, Quarterly Journal*, 77(333):441–444, July **1951.** 3 figs., table, 4 refs. **MH-BH**—Diem's cloud droplet impactor was used to obtain the size distribution of droplets in thin St. Cu. clouds. Results after adjustment are plotted as number of particles/cc. against mass of water, but there is much scatter. Curves of size distribution show a main maximum varying from 6–24μ and a slight secondary maximum at 2–3μ. (*Same item as* 2.10–129, Oct. 1951, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Stratocumulus clouds 3. Cloud meters 4. Drop size distribution.**—*C.E.P.B.*

6F–107 551.577.1 551.509.67

Gabites, J. F., **The formation of rain by natural and artificial processes.** *New Zealand. Meteorological Office, Circular Note*, No. 77, Oct. 24, **1951.** 9 p. refs. p. 8–9. **DWB**—The physical processes believed to lead to the formation of rain are described according to current hypotheses. An estimate is made of the relative effectiveness of the different processes. The possibilities of artificial stimulation of rainfall in New Zealand are discussed. *Subject Headings:* **1. Rain formation 2. Artificial precipitation.**—*Author's abstract.*

6F–108 551.576.1

Garrigue, Hubert, **Prospection aérologique et observations sur la pluie.** [Aerological sampling and observations of rain.] *Académie des Sciences, Paris, Comptes Rendus*, 233(3):267–268, July 16, **1951.** **DWB**—A brief note summarizing the main findings at the Puy-de-Dôme station and by airplanes flying through clouds of various types in the Clermont-Ferrand, Puy-de-Dôme and Vichy-Sancy regions. Height, temperature, cloud type, degree of ionization (1–3) and nature of cloud particles were reported. It is concluded that clouds with temperatures above 0°C produce rain, either naturally or artificially, and clouds with a temperature about −10°C produce ice particles. (*Same item as* 3.6–137, June 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Rain formation 3. France.**—*M.R.*

6F–109 551.578.11

Gunn, Kenrick and Hitschfeld, Walter, **A laboratory investigation of the coalescence between large and small water-drops.** *Journal of Meteorology*, 8(1):7–16, Feb. **1951.** 12 figs., table, 17 refs., 3 eqs. **MH-BH**—The growth of raindrops in clouds by coalescence of raindrops with cloud drops was investigated experimentally by observing the growth of raindrops falling through a 3 meter column of laboratory-made cloud. The increase in mass of the drop is measured by the collection efficiency $E' = \Delta M(\pi S^2 wh)^{-1}$, where w = mass of cloud water in unit volume of cloud, h = height of cloud, ΔM = net increase in mass of falling drop and S = radius of drop. The experimental arrangement for producing the drops and clouds and the procedure for measuring the liquid water content of the cloud and the size of the cloud droplets are described with the aid of diagrams. The collection

efficiencies of a drop of 1.50 mm radius falling through three clouds having different droplet sizes agreed with the aerodynamic collision efficiencies calculated according to Langmuir's theory; every drop-droplet collision resulted in coalescence; charges of the order of 0.2 e.s.u. per drop did not influence collection efficiency. (*Same item as* 2.8–115, Aug. 1951, *MAB.*) *Subject Heading:* **1. Raindrop coalescence.**—*I.L.D.*

6F–110 551.574.1:532.61

Hacker, Paul T. (*Lewis Flight Propulsion Lab., Cleveland, Ohio*), **Experimental values of the surface tension of supercooled water.** *U. S. NACA, Technical Note* 2510, Oct. **1951.** 20 p. diagrs., photos., tables. **DWB**—The surface tension of water has been determined experimentally for the temperature range, 0° to −22.2°C. The weak inflection point in the surface-tension-temperature relation, as indicated by the International Critical Table values for temperatures down to −8°C, was substantiated by the measurements in the temperature range, 0° to −22.2°C. The surface tension increases at approximately a linear rate from a value of 76.96±0.06 dynes per centimeter at −8°C to 79.67±0.06 dynes per centimeter at −22.2°C. *Subject Headings:* **1. Surface tension of supercooled water 2. Supercooled water.**—*NACA abstract.*

6F–111 551.578.1

Hitschfeld, Walter, **Free fall of drops through air.** *American Geophysical Union, Transactions,* 32(6):697–700, Oct. **1951.** 2 figs., 14 refs., 14 eqs. **DWB**—Terminal velocity data of water drops are used for the quantitative description of their accelerated motion when falling freely from rest. The method, based on the principle of aerodynamic similarity, is valid for water drops of radius 1.6 mm or less. Using, as an example, the Schmidt relation for terminal velocity, general expressions are obtained from the time of fall and the distance fallen as functions of the velocity of fall attained. Numerical results calculated from drop radii of 0.625, 1.00 and 1.50 mm agree well with the measurements of Laws. (*Same item as* 3.5–244, May 1952, *MAB.*) *Subject Headings:* **1. Raindrop velocity 2. Terminal velocity of raindrops.**—*Author's abstract.*

6F–112 551.574.1

Hosler, C. L., **On the crystallization of supercooled clouds.** *Journal of Meteorology,* 8(5):326–331, Oct. **1951.** 2 figs., 2 tables, 15 refs. **MH-BH**—Freezing temperatures of droplets in a cold chamber were noted when foreign substances as vapor, spray or gas were introduced. Temperature was independent of crystal form of substance; many were inactive including CdS (hexagonal). Author argues that as surface energy of a small water droplet is increased by freezing, it can only be frozen by increasing size of droplet, decreasing temperature or adding highly polarizable molecules or ions. Since these are in solution, crystal form is unimportant. Iodine being highly polarizable, all its compounds are effective. (*Same item as* 3.4–187, March, 1953, *MAB.*) *Subject Headings:* **1. Freezing nuclei 2. Ice crystal formation.**—*C.E.P.B.*

6F–113 551.508.765:551.574.1

Instruments for cloud research. *Engineering,* London, 171(4435):96, Jan. 26, **1951. DLC**—Description of rotating disk icing meter which is nearly 100% efficient in collecting drops of any size encountered on flights of the Rockcliffe aircraft. The ice formed in 10 seconds on a rotating blade is scrapped off after being measured for thickness by a feeler. The National Research Council of Canada developed another instrument for measuring liquid water content of a cloud with high water content, or an ice crystal cloud; a camera for measuring size of cloud droplets; and an improved thermometer for use on planes in icing conditions. All are described. (*Same item as* 3.11–63, Nov. 1952, *MAB.*) *Subject Headings:* **1. Icing meters 2. Liquid water content of clouds 3. Cloud physics 4. Drop size measurement.**—*M.R.*

6F–114 551.574.1:551.578.4

Itoo, Kyoji, **On the growth of ice crystals in the air.** *Papers in Meteorology and Geophysics,* 2(3/4):315–316, Dec. **1951.** 2 figs., 3 tables. **MH-BH**—Three types of hexagonal plate type ice crystals in the air are shown and a few data are given for the diameter, thickness and volume in different stages of growth. (*Same item as* 4.6–163, June 1953, *MAB.*) *Subject Headings:* **1. Ice crystal formation 2. Cloud physics.**—*A.A.*

6F–115 551.574.1

Kachalsky, E., **The kinetics of phase formation.** (In: Israel. Rainfall Research Committee, **Symposium on artificial rain.** Hakirya, Aug. **1951.** p. 7–18, 4 figs., 8 refs., eqs.) In Hebrew; English summary p. 7–8. **DWB**—The principles of the kinetic theory of phase transition, which is of fundamental importance in understanding the condensation and sublimation processes of water vapor in the atmosphere in the formation of clouds are discussed. The mechanisms proposed by

VOLMER, FARKAS, BECKER and FRENKEL are summarized. (*Same item as* 3.11–178, Nov. 1952, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Cloud formation.**—*I.L.D.*

6F–116 551.576.1:551.574.72:536.42

Kachurin, L. G., **Zamerzanie monodispersynkh vodnykh aerosolei.** [Freezing of monodisperse aqueous aerosols.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:43 49, **1951.** 4 figs., 7 refs., 15 eqs. **DLC**—A method is presented for calculating the freezing of supercooled aqueous aerosols in the case of processes that are not too rapid in comparison to the time of freezing of individual droplets after stable ice nuclei have formed within them. The experimental determination of the energy at the boundary between ice and supercooled water is discussed and an example of the calculation of the complete freezing of supercooled monodisperse aqueous aerosols with a droplet diameter of 10^{-1} to 10^{-3} cm at temperatures of $<100°$ to 0°C is presented. (*Same item as* 3.6–138, June 1952, *MAB.*) *Subject Headings:* **1. Freezing of cloud droplets 2. Ice nuclei 3. Supercooled clouds 4. Aerosols.**—*I.L.D.*

6F–117 551.576.1:551.574.72:536/42

Kachurin, L. G., **Zamerzanie polidispersnykh vodnykh aerozolei.** [Freezing of polydisperse aqueous aerosols.] *Akademia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 2:50–55, **1951.** 3 figs., 9 refs., 18 eqs. **DLC**—Equations for calculating the freezing of polydisperse aqueous aerosols having a Smoluchowski-Schumann distribution are developed. It is shown by calculations of the freezing of aqueous aerosols with the above distribution for varying radii and rates of cooling that the minimum frequency of the formation of ice particles in the atmosphere at temperature −10° to −15°C is determined by the maximum rate of freezing of natural clouds and fogs at these temperatures. (*Same item as* 3.6-139, June 1952, *MAB.*) *Subject Headings:* **1. Freezing of cloud droplets 2. Ice nuclei 3. Supercooled clouds 4. Aerosols.**—*I.L.D.*

6F–118 551.573:551.577.11

†Kinzer, Gilbert D. and Gunn, Ross, **The evaporation, temperature and thermal relaxation-time of freely falling waterdrops.** *Journal of Meteorology*, 8(2):71–83, April **1951.** 10 figs., 2 tables, 14 refs., 29 eqs. **MH-BH**—A detailed treatment of the theoretical and experimental problems of determining the evaporation from freely falling raindrops. History and methods are first discussed. Then takes up the heat and vapor transfer theory, the equilibrium temperature of freely falling drops, time required to reach thermal equilibrium, rate of evaporation when motion is slow and entrainment important. Types of apparatus for measuring various factors are described and illustrated; results of measurements plotted and compared with theory. (*Same item as* 2.10–125, Oct. 1951, *MAB.*) *Subject Heading:* **Evaporation of raindrops.**—*M.R.*

6F–119 551.574.1:551.509.67

Kiriukhin, B. V., **Uprugost' vodianogo para nad zhidkoĭ i zamerzsheĭ kapliami rastvora.** [Water vapor pressure upon liquid and frozen droplets of solution.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, 24(86):48–59, **1951.** 3 figs., 2 tables, 12 refs., 36 eqs. **DLC**—A theoretical analysis of the water vapor pressure on the surface of drops of solutions of NaCl at positive temperatures and at temperatures below 0°C and of the vapor pressure of the surface of ice crystals in solutions. It was found that when nuclei of condensation and ice particles are present in the atmosphere, then up to −22°C condensation nuclei of NaCl are more active and droplets of solution appear first; and at temperatures below −22°C ice crystals are more active and conditions for the sublimation of water vapor are more suitable than for condensation. (*Same item as* 3.5-232, May 1952, *MAB.*) *Subject Headings:* **1. Drop formation 2. Vapor pressure on droplets 3. Cloud physics 4. Ice crystal formation 5. Saline nuclei.**—*I.L.D.*

6F–120 551.574.1(083.3) 551.576.11:001.5

Kiveliovitch, M. and Roulleau, J., **Sur l'évolution des gouttes d'eau dans l'atmosphère.** [On the growth of water drops in the atmosphere, pt. 1–3.] *Journal Scientifique de la Météorologie*, 2(5):1–6, Jan./March **1950;** 3(9):1–8, Jan./March 1951; 3(11):99 -106, July/Sept. **1951.** 2 figs., 3 tables, 7 refs., eqs. English and Spanish summaries. **DWB**—The first article is a theoretical study of various aspects of growth of water drops in clouds, leading to a generalized equation for the time-rate of growth of a drop. In the second article the formula of H. G. HOUGHTON for the growth of a drop of water is tested and found to be accurate. In the third article the authors test their theory of the boundary layer and the formula $R = R_0 \sqrt{\frac{r}{r_0}\frac{u_0}{u}}$ against the experiments made by KINZER and GUNN (1949 and 1951) with reasonable agreement between theory and measurement. (For separate abstracts on each paper *see items* 7–84, 2.9–118 and 3.11 -179, July 1950, Sept. 1951 and Nov. 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Drop accretion.**—*M.R.*

6F–121 551.515.4:551.576.11 (02)

†Kolobkov, N. V., **Grozy i shkvaly.** [Thunderstorms and squalls.] Moscow, Gos. Izdat., **1951.** [2nd ed.] 355 p. 148 figs., 31 tables, 155 refs. **DLC**—In Pt. I, Ch. III there is a thorough discussion of structure, cause, dynamics, forecasting, vertical motions, height, speed of movement, hail and thunderstorm activity connected with cumulonimbus cloud development. Tornadoes and other types of squalls, and synoptic aspects of thunderstorms occupy the remainder of the volume. (For fuller abstract *see item* 5.8–4, Aug. 1954, *MAB.*) *Subject Headings:* **1. Cumulonimbus development 2. Thunderstorms 3. Squalls 4. Textbooks 5. U.S.S.R.**—*M.R.*

6F–122 551.594.21

Kumm, A., **Über die Entstehung von elektrischen Ladungen bei Vorgängen in der kristallinen Eisphase.** [On the origin of electric charges by processes in the crystalline ice phase.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 3(5):382–401, 1951. 5 figs., 2 tables, 13 refs. German, English and French summaries p. 382–383. **MH-BH**—A laboratory examination of results by W. Findeisen (**Meteorologische Zeitschrift,** 1940, 1943) does not confirm them. Rime was formed on an upper cold hemispherical surface, from which particles fell off under certain conditions such as variations of temperature. Charges on these particles were studied; they increased rapidly in frequency from 25×10^{-16} coulomb to 3.5×10^{-15}, more slowly to 3.3×10^{-13}, then remained constant. Mean charge 7×10^{-16}. At all levels + charges are 7–8 times as frequent as − charges. A possible new explanation is discussed, based on polarity of ice needles. The charges developed are too small to account for electricity of thunderstorms. (*Same item as* 3.2–195, Feb. 1952, *MAB.*) *Subject Headings:* **1. Thunderstorm electricity 2. Ice crystals 3. Rime.**—*C.E.P.B.*

6F–123 551.508.765:551.576.11:551.507.352

Levine, Joseph and Kleinknecht, Kenneth S., **Adaptation of a cascade impactor to flight measurement of droplet size in clouds.** *U. S. NACA, Research Memorandum,* E51G05, Sept. 18, **1951.** 28 p. photos., diagrs., graphs, refs., eqs. **DWB**—Report on experiments made at the NACA Lewis Laboratory with a cascade impactor for obtaining the size distribution of droplets. The drops are collected on four slides coated with magnesium oxide to prevent evaporation of the droplet after impingement. By building a diffuser around the instrument it was adapted for cloud droplet size studies for an airplane traveling at about 100 mph. Cross sections and photos are given of impactor and diffuser and their installations as well as photomicrographs of slides exposed in the impactor. Data from two flights are presented. In the appendix the theoretical trajectories of droplets are computed. (*Same item as* 3.11–64, Nov. 1952, *MAB.*) *Subject Headings:* **1. Drop size distribution measurement 2. Air-borne instruments.**—*G.T.*

6F–124 551.574.7

Lewis, William (*U. S. Weather Bureau, Wash., D. C.*), **Meteorological aspects of aircraft icing.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 1197–1203. 4 tables, 19 refs., 3 eqs.) **MH-BH**—The physical characteristics of icing conditions as determined by the parameters of liquid water concentration, drop diameter and temperature; the importance of temperature and drop size in determining the severity of icing for the various components of an aircraft as a result of the variation of the kinetic temperature rise with air speed and the dependence of collecting efficiency upon drop size, air speed and shape of the object; the definition of icing intensity on the basis of the U. S. Weather Bureau scale; and the methods of measuring liquid water concentration and drop size diameter are discussed. The physical processes determining the concentration of liquid water in clouds and the consequent formation of clouds by convection (cumulus and cumulonimbus); by turbulence (stratus and stratocumulus) and by horizontal convergence (altostratus, altocumulus and altocumulus-altostratus); the meteorological conditions responsible for freezing rain and freezing drizzle and statistical data on liquid water concentration and drop size in various types of clouds are summarized. The icing conditions likely to be found in various types of clouds and the problem of forecasting icing conditions in clouds of known type, dimensions and temperature and of flight planning and dispatching in relation to icing conditions are outlined. Problems for further research are recommended and the possible use of ice seeding to reduce icing hazard near airports, single automatic apparatus for determining liquid water concentration and mean drop size conditions under which ice crystals are formed and distribution of drop size in clouds are discussed. (*Same item as* 3.11–5, Nov. 1952, *MAB.*) *Subject Headings:* **1. Icing of aircraft 2. Icing prevention 3. Liquid water content of clouds 4. Drop size distribution 5. Compendium articles.**—*I.L.D.*

6F–125 551.508.769:551.564.7

Ludlam, Frank Henry, **The heat economy of a rimed cylinder.** *Royal Meteorological Society, Quarterly Journal,* 77(334):663–666, Oct. **1951.** fig., 10 refs., 7 eqs. **MH-BH**—The heat loss of a rotating cylinder of given diameter flown through a supercooled cloud is discussed theoretically.

A comparison of the results with theoretical liquid water content of Cu clouds shows that the rotating cylinder technique does not give the maximum concentration which may occur in Cu. (*Same item as* 3.4–69, April 1952, *MAB.*) *Subject Headings:* **1. Icing meters 2. Cumulus clouds 3. Supercooled water.**—*C.E.P.B.*

6F–126 551.574.1

Ludlam, F. H. (*Imperial Col. of Sc. and Tech. and Met. Off., London*), **The physics of ice clouds and mixed clouds.** (In: **Compendium of Meteorology,** Boston, American Meteorological Society, **1951.** p. 192–198. fig., 24 refs.) **MH-BH**—Ice clouds can be distinguished from water or mixed clouds by fibrous appearance or by virga (Fallstreifen) of the former and solid borders or denser streaks in the case of the latter. Recent ideas on function of ice nuclei in cloud growth and precipitation processes are based on work of KRASTANOV (1940 and 1941) whose theory of condensation greatly altered those of WEGENER and FINDEISEN. Work of REGENER and WEICKMANN confirms KRASTANOV's concept. Later work of FOURNIER D'ALBE has shown possibility of having sublimation nuclei action at low ice-supersaturation. Development of ice phase in clouds is discussed at length. (*Same item as* 4.5–8, May 1953, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Ice phase 3. Cirrus forecasting 4. Compendium articles.**—*M.R.*

6F–127 551.574.1:551.578.11

Ludlam, Frank Henry, **The production of showers by the coalescence of cloud droplets.** *Royal Meteorological Society, Quarterly Journal,* 77(333):402–417, July **1951.** 10 figs., 20 refs., 19 eqs. **MH-BH**—In a convective up-current into Cu. cloud, several hundred droplets form per cc., of radius 7–20μ. Drops exceeding 20μ form on large hygroscopic nuclei such as are present in maritime air. Growth by coalescence of droplets of 20–40μ and containing 6×10^{-10} g. NaCl is calculated, using efficiency of catch depending on radius and height. A critical condition for development of showers is a drop radius of at least 150μ at top of a cloud of thickness 1.5–6 km, depending on updraft and temperature at cloud base. If base exceeds 8°C showers may fall from clouds not reaching 0°C. If base is below 0°C (equivalent on average to a sea temperature of 6°C), drop breaking and thunder are unlikely. This is illustrated by a map of sferics plotted in N. Atlantic. (*Same item as* 2.10–128, Oct. 1951, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Rain structure 3. Raindrop formation.**—*C.E.P.B.*

6F–128 551.574.1

Ludlam, Frank Henry, **Structure of shower clouds.** *Nature,* London, 167(4242):254–256, Feb. 17, **1951.** fig., 4 refs., eq. **DWB**—Describes results of further examination of growth of droplets and crystals in cumulus. Growth of a droplet is slow for radius below 30μ, but above that radius increases rapidly in proportion to its velocity relative to smaller drops, concentration of liquid water and density of droplet distribution. In many clouds large droplets, rather than ice crystals, cause the bulk of the precipitation. Graph shows growth of large droplets in cloud with base at 900 mb and 10°C. Author suggests that the most generally profitable procedure in rainmaking would be spraying large droplets or large hygroscopic nuclei into cloud base. (*Same item as* 2.6–94, June 1951, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Artificial precipitation.**—*C.E.P.B.*

6F–129 551.578.7:551.594.21

Lueder, Holger (*Hohenpeissenberg, Germany*), **Ein neuer elektrischer Effekt bei der Eisbildung durch Vergraupelung in natürlichen unterkühlten Nebeln.** [A new electric effect connected with graupel-type ice formation in natural supercooled clouds.] *Zeitschrift für angewandte Physik,* 3(7):247–253, July **1951.** 5 figs., refs. Also his: **Vergraupelungs-elektrisierung als eine Ursache der Gewitterelektrizität.** [Electrification by graupel-type ice formation as a cause of thunderstorm electricity.] *Ibid.,* 3(8):288–295, Aug. **1951.** 2 figs., table, 6 refs., 34 eqs. **DLC**—In the first paper an apparatus used for measuring the electric charge of ice formed in supercooled clouds (Hohenpeissenberg, Oct. 1949, Jan. 1950) is described and results of the measurements are reported. The ice deposited on the measuring instrument had a strong negative charge which contradicts earlier laboratory measurements. Only a part of each cloud droplet was deposited as ice, the other part rebounding in liquid form back into the cloud, with a positive electric charge. The opposite charges existing in the deposited ice and the rebounding drops lead to the assumption that the transition from the liquid into the solid state is accompanied by a separation of electric charges within the droplet. The second paper gives a quantitative calculation of the electric charge emerging from the congelation process within a droplet. The high values obtained appear to provide sufficient explanation for the fact that the electric field in a cloud is restored within a few seconds following a lightning discharge. The electric field created by ion collection is negligible compared with that produced by congelation. *Subject Headings:* **1. Freezing of water droplets 2. Electrification by freezing 3. Thunderstorm electricity.**—*G.T.*

6F–130 551.508.761:551.574.1:77

McCullough, Stuart and Perkins, Porter J., **Flight camera for photographing cloud droplets in natural suspension in the atmosphere.** *U. S. NACA, Research Memorandum*, E50K01a, June 1951. 23 p. diagrs., photos., graphs, refs. **DWB**—Report on cloud droplet photograph experiments made with a shadowgraph optical system and camera developed by the NACA Lewis Laboratory. Magnification of 32 times is said to account for droplets greater than 5 microns, at flight speeds up to 150 mph. Flight tests have shown that approximate droplet-size distribution studies can be obtained. Diagrams and photos of instruments and cloud droplet photos taken in flight are presented. (*Same item as* 4.1-60, Jan. 1953, *MAB.*) *Subject Headings:* **1. Cloud droplet camera 2. Drop size distribution 3. Flight cameras.**—*G.T.*

6F-131 551.574.1 551.578.7 551.578.41 551.576.1

†Mason, Basil John and Ludlam, F. H., **The microphysics of clouds.** *Physical Society of London, Reports on Progress in Physics*, 14:147-195, **1951.** 9 figs., 14 plates, 5 tables, 71 refs., 14 eqs. **DLC**—An exhaustive summary of the voluminous recent literature. Spontaneous condensation of pure water vapor requires supersaturation of about 400%. Authors then discuss mode of action, nature, numbers and radii of condensation nuclei. Growth of droplets in cloud and fog is considered, from direct and indirect determinations of cloud droplet sizes and comparison with theories of SCHUMANN, HOWELL and LANGMUIR. Sec. 5 deals with experiments on initial stages of ice-formation—freezing and sublimation nuclei, supercooling, etc. The formation of ice crystals and snow flakes is considered in relation to cloud types and the formation and growth of hailstones including problem of multiple layers are discussed. Finally, the development of precipitation is analyzed, the efficiency of chain reactions emphasized, and a brief consideration given to artificial precipitation. (*Same item as* 3.3-173, March 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Raindrop coalescence 3. Snow crystal formation 4. Hail formation.**—*C.E.P.B.*

6F–132 551.578.41

Mason, B. J., **Snow crystals, natural and artificial.** *Endeavour*, London, 10(40):205-212, Oct. **1951.** photo., table, diagr., refs. **DLC**—The formation of snow crystals in the atmosphere is discussed and a theory of their growth developed in terms of their molecular and surface structures, their fall-motion and the meteorological conditions in the parent cloud. A simple apparatus for the production of ice crystals in a laboratory is suggested and a technique for preparing plastic replicas of crystals as devised by V. J. SCHAEFER is described. Photomicrographs of snow and ice crystals and plastic replicas are reproduced. A table containing a classification of ice crystals based on H. WEICKMANN's observations according to cloud type, temperature, humidity and vapor pressure range is added. (*Same item as* 3.6-148, June 1952, *MAB.*) *Subject Headings:* **1. Snow crystal formation 2. Cloud physics 3. Snowflake growth. I. Weickmann, Helmut II. Schaefer, Vincent J.**—*G.T.*

6F–133 551.508.765:551.507.352

Massachusetts Institute of Technology. Dept. of Meteorology, **A recorder for an airborne liquid water content measuring instrument.** Contract DA-36-039-sc-124, Technical Report No. 16, July 15, 1951. 30 p. Pt. I, Jensen, Calyton E., **Airborne recorder for liquid water content measuring instrument.** Thesis (M.Sc.)-M.I.T.; Pt. 2, Bemis, Alan C. and Cunningham, Robert M., **Evaluation of the recording capillary collector.** 7 figs., 11 refs. **DWB**—Instruments for measuring the water content of clouds in flight were developed by M.I.T. in 1944 and called capillary collectors. The first paper describes equipment devised to record continually and automatically the water collected, thus avoiding manual reading and setting. The theory and operation of the capillary collector, previous designs of automatic recorders, the transducer recorder and its calibration, errors and computation of records are treated. Suggestions for improvements are also made. Actual records, nomograms and line drawings are appended. In the second paper, BEMIS and CUNNINGHAM find that JENSEN's recorder will be useful under most flight conditions and is rugged, sensitive and dependable. (*Same item as* 3.11-60, 61, Nov. 1952, *MAB.*) *Subject Headings:* **1. Liquid water content of clouds 2. Capillary collectors 3. Cloud physics instruments.**—*M.R.*

6F–134 551.576.11:551.508.765:535.4

Massachusetts Institute of Technology. Dept. of Meteorology, **Measurement of drop size distribution and liquid water content of natural clouds.** Contract AF 19(122)-245, Quarterly Progress Report No. 1–3, Feb. 28, **1951.** 25 p. 2 figs., 39 refs., 39 eqs. Also: Quarterly Progress Report No. 4, May 31, **1951.** 31 p. refs. **DWB**—In the first paper possibilities of various methods of drop size and water content measurement in clouds, especially those based on electrical attenuation and light scattering are analyzed theoretically. In the second paper it is shown that when two hydrosols are mixed mechanically the optical properties of the mixture are not identical with those of the two separate hydrosols. To test this hypothesis experiments were conducted with two

nonodisperse hydrosols. Preliminary data are presented. *Subject Headings:* **1. Drop size distribution measurement 2. Liquid water content of clouds 3. Scattering of light 4. Optical density of hydrosols. I. Keily, D. P.**—*M.R., G.T.*

6F–135 551.574.1:551.508.769

Mount Washington Observatory, Gorham, N. H., **Contribution to the theory of the constitution of clouds.** Contract AF 19(122)-399, Quarterly Progress Reports, April 23, July 23, **1951.** 48+12 p. figs., refs. **DWB**—In the first paper a modified version of the wire-cloth screen technique of droplet sampling is described. The sampling element is a nylon screen coated with confectioner's sugar. The rate of precipitation is determined from the total weight of the drops caught by the screen and retained in a movable plastic bag. Results of observations are included. The second paper reviews previous work done on the correlation between rainfall and drop size distribution. A nomogram is developed to simplify the computations from the drop size measurements and for determining liquid water content and radar reflectivity. Five sample rainfall observations were selected from 80 taken at Cambridge, Mass., and analyzed. *Subject Headings:* **1. Cloud physics 2. Drop size distribution 3. Nomograms.**—*I.L.D., W.S.*

6F–136 551.574.1:551.578.41

Nakaya, Ukichiro (*Hokkaido Univ., Sapporo, Japan*), **The formation of ice crystals.** (In: **Compendium of Meteorology.** Boston, American Meteorological Society, **1951.** p. 207–220. 28 figs., 2 tables, 15 refs.) **MH-BH**—After a discussion of the physics of freezing of water drops, 5 forms of crystalline frost are outlined and window frost (and the effect of organic substances) or ice described. Historical classifications of snow crystals are mentioned and the present day general system of classification is outlined in detail accompanied by description and sketches of all types of crystals in the classification. The simpler **Practical classification of snow crystals and solid precipitation** elaborated by the International Commission on Snow and Ice in 1948–9 is also presented. Artificial methods of producing snow crystals and resulting data on growth of snow crystals, and relation of crystals to environment, are treated next. By applying the knowledge of relationship between type of crystal and temperature or supersaturation gained through quantitative laboratory experiments, inferences can be drawn as to structure of upper atmosphere and the source, and temperature of level where snow crystals are produced in nature, when natural crystals are compared with those produced in laboratory. Theories of SHEDD, WEGENER and FINDEISEN as to mechanism of snow crystal formation are evaluated critically. Several examples of inferences drawn from various types of natural crystals are given, the crystals shown photographically and the physical conditions (temperature and humidity of source layer and layers through which crystal fell, time for formation and rate of fall involved) shown graphically and discussed. (*Same item as* 4.4–12, April 1953, *MAB.*) *Subject Headings:* **1. Snow crystals 2. Ice crystal formation 3. Solid deposits 4. Photomicrographs 5. Compendium articles.**—*M.R.*

6F–137 551.578.11

Neumann, J., **Drop size and relative mass contributed in rain.** *Journal of Meteorology,* 8(3): 205–206, June **1951.** fig., 3 refs., 6 eqs. **DWB**—The author demonstrates that the maxima of the family of curves for different rain intensities fall on a rectangular hyperbole. (*Same item as* 3.3–199, March 1952, *MAB.*) *Subject Headings:* **1. Raindrop size distribution 2. Rainfall intensities.** —*I.L.D.*

6F–138 551.574.1

Ohta, S., **Vapour pressure of a small solution particle. (Studies on condensation nuclei, Pt. 5.)** *Journal of Meteorological Research,* Tokyo, 3(2):45–50, Jan. **1951.** fig., table, 5 refs., eqs. In Japanese; English summary p. (2). **DWB**—Equations for the vapor pressure of a small solution particle are derived from the differential equations of thermal equilibrium and also from the virtual change of free energy. The relation between the radius of the particle and the relative humidity at the critical conditions was calculated numerically for nuclei consisting of H_2SO_4 and NaCl. (*Same item as* 3.6–131, June 1952, *MAB.*) *Subject Headings:* **1. Vapor pressure over drops 2. Condensation nuclei.**—*From author's abstract.*

6F–139 551.576.11

Otani, S. (*Tokyo District Met. Obs.*), **Theoretical aspect on size distribution of cloud particles and its application to stratus cloud.** *Geophysical Magazine,* Tokyo, 23(1):65–71, Dec. **1951.** 4 figs., 3 tables, 9 refs. **MH-BH**—Discusses size distribution in a cloud in which small particles are generating and growing continuously. Proposes frequency (ϕ) distribution $\phi = re^{-\alpha r^2}$ (r—radius of particle) and compares it with observations. Since evaporation time of cloud particles is proportional to r^2, the size distribution in some stratus clouds does not differ, although the water content increases with height. Relations between supersaturation and particle size in the state of generating cloud

are discussed. (*Same item as* 4.9–174, Sept. 1953, *MAB.*) *Subject Headings:* **1. Drop size distribution 2. Stratus clouds 3. Evaporation.**—*A.A.*

6F–140 551.574.1:551.576.11

Rau, Walter, **Eiskeimbildung durch dielektrische Polarisation.** [Formation of ice nuclei by dielectric polarization.] *Zeitschrift für Naturforschung*, 6a(11):649–657, Nov. **1951.** 2 figs., 20 plates, table, refs. **DLC**—Describes cold-chamber experiments in which ice pellets were produced from supercooled water drops by means of an electric field under complete elimination of condensation nuclei or shocks. The process can take place at temperatures from −11°C downward. Such nuclei-free ice pellets may form in the atmosphere in the presence of a strong electric field. The mechanism of such ice formation is discussed. *Subject Heading:* **1. Freezing of cloud droplets.**—*G.T.*

6F–141 551.574.1551.577.11

Sheppard, P. A., **The physics of clouds and their precipitation.** *Endeavour*, London, 10(38): 89–94, April **1951.** 4 figs., 12 refs. **DLC**—A concise, nontechnical summary of the physics of cloud formation and their precipitation. The various theories on the growth of cloud droplets are discussed and evidence indicating that clouds are generally stable colloids is presented. The work of FOURNIER, FINDEISEN and of MASON on the formation of ice clouds and BERGERON's theory of precipitation and artificial precipitation are discussed. (*Same item as* 2.9–121, Sept. 1951, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Precipitation formation.**—*I.L.D.*

6F–142 551.576.1:551.577.11

Sherman, L., **Photographs of the "complete precipitation" of a cumulus cloud.** *Tellus*, 3(3): 203–204, Aug. **1951.** 3 figs., 4 refs. **MH-BH**—The photographs of "complete precipitation" of a cumulus cloud and the accompanying record of a sounding (temperature, elevation and relative humidity) taken in the Pacific in lat. 16.2 N and long. 152.8 W, confirm the observation of PALMER and ELSASSER that in low latitudes the entire cumulus cloud may precipitate and disappear and in the last stage precipitation falls from the clear sky. The cloud begins to show evidence of shear and then precipitation starts and in the final stage its precipitation may be taken for cirrus. (*Same item as* 3.11–190, Nov. 1952, *MAB.*) *Subject Headings:* **1. Cumulus clouds 2. Precipitation mechanism 3. Cloud photographs.**—*I.L.D.*

6F–143 551.574.1:551.576.11

Shishkin, N. S., **O sliianii oblachnykh kapel'.** [Coalescence of cloud droplets.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 24(86):27–31, **1951.** 3 figs., 7 tables, 8 refs., 28 eqs. **DLC**—After a brief theoretical discussion of the growth of raindrops by condensation, the author presents a theoretical analysis of the mechanism of coalescence. The discussion covers the collision of droplets in the field of gravity, growth of drops by coagulation in the field of gravity, and the coalescence of drops during sudden changes in the velocity of air flow and during periodic changes in the velocity of air flow. (*Same item as* 3.5–234, May 1952, *MAB.*) *Subject Headings:* **1. Drop accretion 2. Cloud physics 3. Coalescence.**—*I.L.D.*

6F–144 551:577.11:551.574.1:551.576.11

Shishkin, N. S., **Osadki iz konvektivnykh oblakov.** [Precipitation from convective clouds.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 24(86):39–47, **1951. DLC**—A theoretical investigation of the intensity of precipitation from clouds in which the density of saturated vapor pressure and radius of the drops vary with height, approximately as under natural conditions. The author demonstrates a procedure for calculating the growth of drops by condensation in purely aqueous clouds and the number of raindrops and the intensity of rainfall and discusses the growth of particles in clouds containing water in the solid phase. (*Same item as* 3.5–237, May, 1952, *MAB.*) *Subject Headings:* **1. Precipitation mechanism 2. Drop accretion 3. Convective clouds 4. Cloud physics.**—*I.L.D.*

6F–145 551.578.11:551.576.11

Shvets, M. E., **K voprosu ob izuchenii oblachnykh kapel' na tverdykh telakh.** [The falling of cloud droplets on solids.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 24(86): 80–82, **1951.** 7 eqs. **DLC**—In order to study the trajectories of large drops experimentally, the author develops models for the movement of drops which satisfy the criteria of similarity of relative motion of the drop and that of fluid currents. (*Same item as* 3.6–146, June, 1952, *MAB.*) *Subject Headings:* **1. Raindrop velocity 2. Cloud physics 3. Drop formation.**—*I.L.D.*

6F–146 551.578.11:551.573

Shvets, M. E., **Ob isparenii kapli v potoke.** [On evaporation of drops in an (air) current.] *U.S.S.R. Glavnoe Uprovlenie Gidrometeorologicheskoĭ Sluzhby, Informatsionnyi Sbornik*, 1:37–41,

1951. fig., 6 refs., 16 eqs. **DLC**—An analysis of evaporation process of a spherical drop with average values of Reynolds numbers for the stream blowing around the drop. The author determined mathematical expressions for the evaporation of an immobile drop, the evaporation in a flow of moderate speed and the changes of radius of a drop during its fall. (*Same item as* 4.1–194, Jan. 1953, *MAB.*) *Subject Heading:* **1. Evaporation of raindrops.**—*N.T.Z.*

6F–147 551.574.1:551.576.11:551.578.1

Smith, E. J., **Observations of rain from non-freezing clouds.** *Royal Meteorological Society, Quarterly Journal*, 77(331):33–43, Jan. **1951.** 3 figs., 3 tables, 13 refs. **MH-BH**—Definite observations of rain from clouds above 32°F were made in three aircraft flights near Sydney, Australia, and by radar; radiosondes were also available. In the first, moderate or heavy rain fell from a cumulus ridge penetrating StCu. Temperature outside peak of cloud (10,000 ft.) 6°C. The cloud was very wet and non-turbulent, no ice was seen and radar suggested many large drops near the top. In second case light rain fell from a Cu ridge, top at 8400 ft. at 1°C. Observations of drop size and density made. In the third, moderate to heavy rain fell from a Cu cloud with top about 11,000 ft, 6°C. Radar observations within the cloud showed raindrops. (*Same item as* 2.5-129, May 1951, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Radar observations 3. Rain formation 4. Cloud dissolution.**—*C.E.P.B.*

6F–148 551.576.11 551.577.11

Steinhäusser, Hans, **Physik der Wolken.** [Physics of clouds.] *Naturwissenschaftliche Rundschau*, 4(12):505–511, Dec. **1951.** 6 figs., 10 refs. **DWB**—A summary of recent investigations, especially by Findeisen, on cloud physics and formation of precipitation. Discusses: the atmosphere as a colloid, condensation nuclei, stability of drops and ice particles at different relative humidities, coagulation, condensation and sublimation nuclei. He then discusses physics of precipitation from Cu and stratiform clouds and, finally, refers to the problem of artificial rain. (*Same item as* 3.4–194, April 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Precipitation formation.** —*C.E.P.B.*

6F–149 551.576.11

Stommel, Henry, **Entrainment of air into a cumulus cloud.** *Journal of Meteorology*, 4(3):91–94, June **1947.** Pt. 2. *Ibid.*, 8(2):127–129, April **1951.** 11 figs., 2 tables, 9 refs., eqs. **MH-BH**—In the first article a theory of convective clouds is presented, the fundamental hypothesis being that the ascending current in a cloud entrains air from its surroundings. A method is developed for computing the amount of entrainment from a knowledge of the temperature and specific humidity inside and outside the cloud. The concentration of water in the form of drops is also determined. Finally, the theory is applied to some observations of trade cumulus made near San Juan, Puerto Rico. In the second paper two examples of vertical velocity distribution are treated. (For fuller abstract on Pt. II *see item* 2.11–140, Nov. 1951, *MAB.*) *Subject Headings:* **1. Entrainment 2. Vertical velocities 3. Cumulus cloud formation 4. Liquid water content of clouds.**—*Author's abstract.*

6F–150 551.594.25

Thunderstorm electrification. *Meteorological Magazine*, London, 80(943):15–18, Jan. **1951. DWB**—Abstact and discussion by G. D. Robinson of 3 papers by Ross Gunn (1947–1950). T. W. Wormell described two unpublished researches at Cambridge on electrical charges on individual raindrops showing effect of capture of ions, and radar investigation of vertical structure of thunderstorms showing intense echoes from near cloud base. J. A. Chalmers, F. J. Scrase and R. F. Jones also described recent researches. (*Same item as* 2.6–151, June 1951, *MAB.*) *Subject Headings:* **1. Electricity of precipitation 2. Thunderstorm structure. I. Gunn, Ross.**—*C.E.P.B.*

6F–151 551.573:551.526

Tverskaia, N. P., **Temperatura ispariaiushchikhsia kapel'.** [Temperature of evaporating drops.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. i Geofiz.*, 15(1):74–81, **1951.** fig., 6 tables, 4 refs., 3 eqs. **DWB**—By assuming that a drop behaves like a psychrometer, the author derives from the psychrometric formula an expression for determining theoretically the temperature of evaporating drops. The expression is $T_d = T_a - A(E_d - e)$; T_d = temperature of the drop; T_a = temperature of the air; E_d = vapor pressure of the drop; e = vapor pressure of the air; A = the psychrometric constant. Value of A was determined experimentally by the use of a special chamber in which the temperature of the drops was measured with a thermocouple attached to a mirror galvanometer. Values for A are determined in moving and in still air and for supercooled and freezing drops. They ranged between 1.7 and 2.1. A nomogram for calculating the temperature of evaporating drops under any atmospheric condition is given. (*Same item as* 3.9–180, Sept. 1952, *MAB.*) *Subject Headings:* **1. Evaporation of raindrops 2. Raindrop temperature data.**—*I.L.D.*

6F–152 551.593.652:551.588.2

Wehner, Hans, **Ein Beitrag zum Problem der hohen Perlmutterwolken.** [A contribution to the problem of high mother-of-pearl clouds.] *Meteorologische Rundschau*, 4(9/10):180–181, Sept./Oct. **1951.** fig., 6 refs. **MH-BH**—Criticizes cold stratosphere theory of H. Dietrichs (*see item* 9–152, Sept. 1950, *MAB*) on the example of Jan. 30, 1944, which Wehner associates with a warm stratosphere over Norway. These clouds are obstacle clouds in ozone inversion in northern West-weather type, visible because of clear skies in lee of mountains. (*Same item as* 3.8–218, Aug. 1952, *MAB.*) *Subject Headings:* **1. Nacreous clouds 2. Topographic effects.**—*C.E.P.B.*

6F–153 551.574.1

†Weickmann, Helmut K., **A theory of the formation of ice crystals.** *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 4:309–323, **1951.** 8 figs., 37 refs. English, German and French summaries p. 309–310. **DWB**—Author summarizes theories and experiments on formation of ice crystals on nuclei and sets out a theory of "oriented overgrowth (epitaxy)." "Any suitable host crystal can orient an adsorbed layer of H_2O molecules. By piling up other layers of H_2O molecules a very small ice crystal (ice seed) is created which can grow in supercooled water. . . . Calculations of the effective temperature of mica, AgI and quartz are in fairly good agreement with experiment. This theory permits an explanation of the observed thresholds of ice formation which occur at about −20°, −30°, −40° and −60°C. Occasionally capillary condensation of water molecules on a freezing nucleus will occur when the vapor is saturated with respect to ice but not with respect to water. . . ." (*Same item as* 3.3–174, March 1952, *MAB.*) *Subject Heading:* **1. Ice crystal formation.**—*From author's abstract.*

6F–154 551.574.1

Wilson, J. G., **The principles of cloud-chamber technique.** Cambridge, University Press, **1951.** 131 p. 33 figs., 17 tables, bibliog. p. 128–129, 64 eqs. **DWB**—The first chapter deals with condensation and growth of drops. It contains a brief review of the early work of Coulier and Aitken on the necessity of nuclei for condensation and a theoretical discussion of the stability of charged drops, of the growth of drops from charged nuclei, of condensation on uncharged nuclei, of condensation in mixed vapors, of the effect of contamination, of re-evaporation nuclei and of the rate of growth of drops. *Subject Headings:* **1. Cloud physics 2. Condensation nuclei.**—*I.L.D.*

6F–155 551.574.1:551.578

†Zamorskii, A. D., **Atmosfernyĭ led.** [Atmospheric ice.] *Priroda*, Moscow, 40(1):24–32, Jan. **1951.** 9 figs., table, 30 refs. **DLC**—A popular exposition of the present state of knowledge on ice in the atmosphere. The author presents a new and systematic classification of atmospheric ice (though he himself considers it controversial and not very comprehensive) and discusses the variety of processes of ice formation with emphasis on the significance of supercooled water. The structure and shape of various kinds of atmospheric ice (snow, hail, rime, sleet, frost, surface icing, etc.) are described. The paper contains numerous illustrations and a bibliography of Russian and foreign literature on the subject. (*Same item as* 3.9–184, Sept. 1952, *MAB.*) *Subject Headings:* **1. Ice crystal formation 2. Condensation nuclei.**—*C.K.*

6F–156 551.574.1:551.578.41

*†Zamorskii, A. D., **Koaguliatsionnyĭ rost snezhinok.** [Growth of snowflakes by coalescence.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, No. 24(86):60–79, **1951.** 7 figs., 15 tables, 24 refs. **DLC**—This article consists of an extensive critical review of the literature and observational data collected by the author. The following topics are covered, viz.: the coagulation of snowflakes with cloud droplets, the shape and size of ice nuclei of snowflakes, the transition of crystals into grains, the incidence and properties of nucleated snowflakes, and the process of the coalescence of snowflakes. (*Same item as* 3.8–141, Aug. 1952, *MAB.*) *Subject Headings:* **1. Snowflake coalescence 2. Cloud physics 3. Snow crystal nuclei.**—*I.L.D.*

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6F–157 551.574.1:551.578.41

aufm Kampe, Hans Joachim, **Feuchtigkeitsverhältnisse in Cirruswolken und die daraus resultierenden Formen der Eiskristalle.** [Humidity conditions in cirrus clouds and the resulting forms of ice crystals.] *Germany. Deutscher Wetterdienst in der US-Zone, Berichte*, No. 38:298–302, **1952.** 8 figs., table, 10 refs., 8 eqs. **DWB**—Assuming various plausible concentrations of particles, the growth of ice crystals and the resulting decrease of relative humidity of CiSt are calculated. It is concluded that while CiSt is mostly formed in air slightly under-saturated with respect to water, the tufted crystals of CiCu form in supersaturated air. For regular prisms a humidity of about 110% with respect to ice appears necessary. (*Same item as* 4.2–181, Feb. 1953, *MAB.*) *Subject Headings:* **1. Snow crystal formations 2. Ice crystal forms 3. Cirrus clouds.**—*C.E.P.B.*

6F–158 551.591.1:551.574.1:551.576.1

aufm Kampe, Hans Joachim and Weickmann, Helmut K., **Trabert's formula and the determination of the water content in clouds.** *Journal of Meteorology*, 9(3):167 171, June **1952.** 3 figs., 11 refs., 5 eqs. **DWB**—In TRABERT's formula $V=Cr/W$ relating visibility V m in clouds to water content W gm/m² and droplet radius $r\mu$, C is found empirically as about 6. Theoretically the formula is $2.6\Sigma(n_i r_i^2)/W\Sigma(n_i r_i^2)$. The discrepancy is shown to be due to the range of r in some clouds from 2–100μ. From aircraft observations it is found that if the droplet spectrum is narrow (fair weather Cu) $V=2.6r/W$ nearly; with a wide spectrum C is larger. (*Same item as* 3I–277, Sept. 1952, *MAB.*) *Subject Headings:* **1. Visibility 2. Water content of clouds.**—*C.E.P.B.*

6F–159 551.574.1

Best, A. C., **Effect of turbulence and condensation on drop-size distribution in cloud.** *Royal Meteorological Society, Quarterly Journal*, 78(335):28–36, Jan. **1952.** fig., table 6 refs., 27 eqs. **DWB**—The effect of coalescence of droplets in a layer cloud is examined. Equations are developed to represent rate of change of number of drops owing to condensation and coalescence, and these are evaluated numerically under various assumptions. It is found that except for large drops the increase in the number, within a given diameter range, due to condensation, is much larger than that due to coalescence (which may result in a decrease). The balance between condensation and diffusion in the steady state is examined and an Incomplete Gamma function is deduced for drop size distribution, which agrees closely with an earlier empirical formula and with measured values. (*Same item as* 3.4–184, April 1952, *MAB.*) *Subject Headings:* **1. Drop size distribution 2. Drop accretion.** —*C.E.P.B.*

6F–160 551.578.11:551.573

Best, A. C., **The evaporation of raindrops.** *Royal Meteorological Society, Quarterly Journal*, 78(336):200–225, April **1952.** 13 figs., 13 tables, 10 refs., 48 eqs. **DWB**—Change of surface area of a drop of radius 0.15 mm or more falling through z m. $=\text{const.}(1-f)^{1.13}\exp(-lz)$ where $f=\text{R.H.}/100$; values of const. and l are given for ICAN and standard tropical atmospheres. For smaller drops change of volume is proportional to $(1-f)^{1.062}\exp(-lz)$. Effects of evaporation on size distribution of drops falling through a constant atmosphere, and on the radar response, are examined. It is shown that with rain falling through air initially unsaturated, excess of temperature above steady state value, and of relative humidity below 100%, decrease exponentially to zero, with time; values for different initial states and different rates of rainfall are calculated. Results agree with those of DOLEZEL (1944). (*Same item as* 3.8–152, Aug. 1952, *MAB.*) *Subject Heading:* **1. Evaporation of raindrops.**—*C.E.P.B.*

6F–161 551.578.11:631.43

Bitiukov, K. K., **Velichina dozhdevykh kapel' i ikh vozdeĭstvie na pochvu.** [The size of rain drops and their effect upon the soil.] *Meteorologiia i Gidrologiia*, No. 6:33–35, **1952.** 2 tables, 6 refs. **DLC**—Report on special experiments during 1948–1950 made at laboratory and Ukrainian irrigation stations of the All-Union Institution of Hydraulic Engineering and Reclamation. The size of rain drops was determined by measuring the diameters of spots on special colored filter paper. The investigations indicated that the mean sizes of rain drops were 0.5–1.5 mm for 87.7% of rain cases; sizes less than 0.5 mm were observed for 5.1% cases and sizes more than 1.5 mm for 11.2%. The greatest homogeneity of drop sizes was observed in drizzle. An increase in rain sizes and in range of sizes accompanied increase in rain intensity. For example, the mean size of drops for rain intensity less than 0.03 mm/min was 0.75 mm, but for rain intensity of 0.1 mm/min it increased to 1.4 mm. The greater size of rain drops caused an acceleration of falling drops near the soil surface. The observed speed of falling was about 0.8 m/sec for drops of about 0.2 mm, and about 7.7 m/sec. for drops of about 4.0. The big rain drops also had more influence on the physical state of soil surface (pulverization of soil particles, formation of soil crust, etc.). (*Same item as* 6.2–271, Feb. 1955, *MAB.*) *Subject Headings:* **1. Rain-drop sizes 2. Soil mechanics.**—*N.T.Zikeev.*

6F–162 551.508.765:551.578.11

Boucher, Roland J. (*Cambridge, Mass.*), **Results of measurements of raindrop size.** *Illinois. State Water Survey Div., Bulletin*, No. 41, **1952.** p. 293–297. **DWB**—A technique of measuring raindrop size distribution using a nylon screen is described. Results of 63 rain samples obtained by this method at Cambridge give a value of $Z=269\ R^{1.55}$ by a regression of log Z on log R. The standard error is 47%. A better fitting line, obtained by trial and error, is $Z=180R^{1.55}$, which reduced the standard error to 38%. (*Same item as* 4.8–54, Aug. 1953, *MAB.*) *Subject Heading:* **1. Raindrop size distribution measurement.**—*Author's abstract.*

6F–163 551.515.41

Braham, Roscoe R., Jr., **The water and energy budgets of the thunderstorm and their relation to thunderstorm development.** *Journal of Meteorology*, 9(4):227–242, Aug. **1952.** 17 figs., 5 tables,

9 refs., 6 eqs. **DWB**—Using Thunderstorm Project data from Florida and Ohio, author discusses water sources and sinks, and flux of water vapor in a thunderstorm cell. He estimates vertical mass exchange in various ways. Total inflow averages 8.9×10^8 kg vapor, of which 5.3 is condensed. This is divided between rainfall 1 kg, evaporation from sides and residual cloud 1.9, re-evaporated in downdraft 2.4. Energy budget and restratification are found from latent heat, entrainment and redistribution of energy within air mass; energy of lightning flashes to ground is negligible. The relation of water and energy budgets to convective development is discussed, using a nomogram to compute work done in lifting 1 kg of air through 100 m. (*Same item as* 4.4–120, April 1953, *MAB.*) *Subject Headings:* **1. Thunderstorm dynamics 2. Thunderstorm Project.**—*C.E.P.B.*

6F–164 551.577.1

Brewer, Alan W., **Why does it rain?** *Weather*, 7(7):195–198, July **1952.** 6 refs. **DWB**—Clear popular article on the causes of precipitation on freezing nuclei and from nonfreezing clouds. *Subject Heading:* **1. Rain formation.**—*C.E.P.B.*

6F–165 551.576.11:551.594.12

Cochet, Robert, **Captation de particules neutres par un obstacle électrisé.** [Collection of neutral particles by an electrically charged object.] *France. Centre National de la Recherche Scientifique, Journal des Recherches*, No. 19:153–180, June **1952.** 35 figs., 16 refs., 40 eqs. **MH-BH**—A formula expressing the collection rate of water droplets from fog or clouds by an object with an electric charge is developed and applied to two particular cases: (1) electric power lines and (2) water droplets with an electric charge. The section dealing with problem (2) was also published as a separate paper in a slightly different arrangement (*see item* 6F–166). *Subject Headings:* **1. Drop accretion 2. Electrical charges on drops 3. Electric power lines.**—*G.T.*

6F–166 551.576.11:551.594.12

Cochet, Robert, **Évolution d'une gouttelette d'eau chargée dans un nuage à température positive.** [Growth of a charged water droplet in a cloud at temperatures above freezing.] *Annales de Géophysique*, Paris, 8(1):33–54, Jan./March **1952.** 17 figs., 12 refs., eqs. English summary p. 33. Shorter version in: *Académie des Sciences, Paris, Comptes Rendus*, 233(2):190–192, July 9, **1951.** graph, refs. **DWB**—Expressions are derived for the growth of water droplets as a function of their size and electric charge. Results are graphically presented. It is found that small droplets with a high electric charge grow most rapidly within short trajectories. Thus droplets with a diameter of 30μ, if sufficiently charged, show the same properties in growth as uncharged droplets of 120μ diameter. The use of charged droplets for cloud seeding purposes is advantageous because a small amount of the seeding agent is sufficient. (*Same item as* 3.9–188, Sept. 1952, *MAB.*) *Subject Headings:* **1. Drop accretion 2. Electrical charges on drops 3. Cloud seeding with electrified spray.**—*G.T.*

6F–167 551.574.1(794)

Crozier, W. D., Seely, Ben K. (*New Mexico Inst. of Mining and Tech., Socorro, N. Mex.*), and Thompson, A. H. (*Univ. of Calif., Dept. of Met.*), **A second chloride cloud in California.** *American Meteorological Society, Bulletin*, 33(4):177–178, April **1952.** 3 refs. **MH-BH**—A report of a chloride cloud observed on Sept. 13 and 14 during airplane flights over the Mojave Desert between Death Valley and the coastal mountains. The cloud was at an elevation of 10,000 ft and its chloride concentration ranged up to 10^4 particles per m^3. Air trajectories led back to the vicinity of a tropical disturbance off Baja California. However, the chloride cloud was not accompanied by an increase in moisture content of the air in its vicinity. It is concluded "that the chlorides were in air primarily from the Pacific high, but with an admixture from the region of the tropical disturbance off Baja California." (*Same item as* 4.2–183, Feb. 1953, *MAB.*) *Subject Headings:* **1. Cloud structure 2. California.**—*I.L.D.*

6F–168 551.57:551.515.1

Cunningham, Robert M., **Distribution and growth of hydrometeors around a deep cyclone.** Massachusetts Institute of Technology. Dept. of Meteorology. Contract DA-36-039-sc-124, Project DA-3-99-05-022, Technical Report, No. 18, May 9, **1952.** 59 p. 47 figs., 6 tables, 37 refs. **DWB**—A complete analysis made for a single storm (April 3, 1951) by means of an instrumented aircraft and radar precipitation echoes. Results compared with those from other storms. Author presents surface and upper level charts, gives numerous cross sections based on aircraft soundings, compares radar photographs with recorded precipitation and computes the growth of hydrometeors during their fall, considering fall velocity, sublimation, evaporation, coalescence, etc. (*Same item as* 5.4–171, April 1954, *MAB.*) *Subject Headings:* **1. Cyclone structure 2. Hydrometeors 3. Drop accretion 4. Cloud physics 5. Radar precipitation echoes.**—*A.A.*

6F–169 551.574.1:551.524

Dufour, Louis and Defay, Raymond, **Températures de coexistence de cristaux de glace et de gouttes salées dans l'atmosphère.** [Temperatures at which atmospheric ice crystals and salt-water droplets may coexist.] *Belgium. Institut Royal Météorologique, Publications, Ser. B,* No. 5, **1952.** 19 p. fig., refs., 37 eqs. **DWB**—General formulas are developed for calculating the temperature at which both ice crystals and salt-water droplets may be found in the atmosphere. The values considered in setting up the formulas are crystal and droplet radius, atmospheric pressure and degree of solution. The functions are worked out for the case of crystals and droplets suspended in the air and also for crystals totally or partially contained in a salt-water droplet suspended in the air. (*Same item as* 5.6–200, June 1954, *MAB.*) *Subject Headings:* **1. Freezing temperatures 2. Ice crystals 3. Saline nuclei.**—*G.T.*

6F–170 551.574.1:551.576.11

Ehrenberg, Wolfgang W., **Beitrag zum Problem der Eisbildung in Wasserwolken.** [Contribution to the problem of ice formation in water clouds.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A,* 5(2):158–165, **1952.** 3 figs., 4 refs., 4 eqs. German, English, French summaries p. 158. **DWB**—By spraying glass of container with paraffin or smearing with vaseline, distilled water drops could be supercooled to −10°C. A method of finding total surface of fine particles is described. Supercooling at formation of ice nuclei increased with log (total surface); quartz, pampas dust, cellulose, volcanic ash, charcoal and AgI prepared by various methods gave rather similar results, so that chemical composition is less important than surface area. An effective area is 1/20 cm^2 per cm^3 water. The energy of agitation determines the probability of formation of ice nuclei. Theoretical implications are discussed. (*Same item as* 4.4–184, April 1953, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Artificial condensation 3. Supercooling of water.**—*C.E.P.B.*

6F–171 551.578.11

Farley, F. J. M., **The theory of condensation of supersaturated ion-free vapour.** *Royal Society of London, Proceedings, Ser. A,* 212:530–542, **1952.** 3 figs., 2 tables, 10 refs., 37 eqs. **DWB**—It is shown that in a supersaturated atmosphere there is a critical size above which a drop will tend to grow larger. Hence in air passing from saturation to supersaturation small drops will evaporate and large drops grow until a steady distribution is set up in which I drops are formed per second. An expression for I is calculated and gives reasonable agreement with cloud chamber experiments. (*Same item as* 4.1–190, Jan. 1953, *MAB.*) *Subject Heading:* **1. Drop formation.**—*C.E.P.B.*

6F–172 551.576.11:551.510.53

Farquharson, James Strachan, **Cloud in the stratosphere.** *Meteorological Magazine,* London, 81(965):341–345, Nov. **1952.** 3 figs., ref. **MH-BH**—Air with cloud at 47,000 ft over England Aug. 10, 1951, is traced back to Hudson Bay and was probably ice crystals. Other American examples of saturation around 120 mb level are quoted. Upper air conditions over England on Aug. 10, 1951 are then examined, showing dynamic cooling in the layer in which the cloud formed. (*Same item as* 4.4–194, April 1953, *MAB.*) *Subject Heading:* **1. Stratospheric clouds.**—*C.E.P.B.*

6F–173 551.576.1:551.576.4

Fletcher, R. D. and Sartor, Doyne (*U. S. Air Wea. Ser., Wash., D. C.*), **Cirrus.** *Weatherwise,* 5(1):8–9, Feb. **1952.** 2 figs. **DWB**—Results of an analysis of pilots' reports indicate that cirrus is usually more extensive, thicker and higher than reported by observers on the ground and is complicated by haze layers and change from night to day. Bottoms of cirrus layers are usually more ragged than tops. The tops often coincide with base of an inversion layer. Sometimes marked turbulence occurs in cirrus clouds, and this may be anticipated in areas where curved tails appear. Statistics on heights of cirrus bases and tops reported by pilots indicate inverse relation to latitude in general, and wider range of height (20 to 40 thousand feet) at 30°–35°N than at 45°–50°N. Base temperatures range from −15° to −55°C (mostly −15° to −30°). (*Same item as* 3.10–221, Oct. 1952, *MAB.*) *Subject Headings:* **1. Cloud observation 2. Cloud height 3. Cirrus clouds 4. Pilot reports.**—*M.R.*

6F–174 537 551.594.21:551.594.25:551.578.1

Gill, E. W. B. and Alfrey, G. F., **The electrification of liquid drops.** *Physical Society of London, Proceedings, Ser. B,* 65(394):546–551, **1952.** 2 figs. **DWB**—Describes experiments to show electrical charges on drops due to: 1. Drops or spray falling through an electrified cylinder; 2. Breaking of drops by air blast giving a considerable + charge on target onto which spray was blown, caused by rebounding of drops from target; charge was greatest when distilled water was used. ZELENY's experiment (1933) is discussed. When spray was blown on ice, ice acquired a + and rebounding drops a − charge. (*Same item as* 4.5–226, May 1953, *MAB.*) *Subject Headings:* **1. Electricity of precipitation 2. Thunderstorm electricity 3. Electrical charges on drops.**—*C.E.P.B.*

6F–175 551.594.25:551.578.1

Gill, E. W. B., and Alfrey, G. F., **Production of electric charges on water drops.** *Nature*, London, 169(4292):203–204, Feb. 2, **1952. DLC**—While distilled water is freezing on an immersed chilled copper block a large potential develops, ice positive, water negative. This is attributed to a + charge frozen in growing ice layer and leaking to surface. As ice melts, a small reverse potential sometimes develops. Application to water droplets impinging on ice particles is that part which freezes leaves a + charge and part which rebounds carries away a − charge. (*Same item as* 3.8-227, Aug. 1952, *MAB.*) *Subject Headings:* **1. Electricity of precipitation 2. Electrical charges on drops.** —*C.E.P.B.*

6F–176 551.578.41

Gold, L. W. and Power, B. A., **Correlation of snow-crystal type with estimated temperature of formation.** *Journal of Meteorology*, 9(6):447, Dec. **1952.** fig. **MH-BH**—Types of snow crystals reaching ground at Montreal are compared with estimated temperature of parent cloud. Peak temperatures (C): columns −25 to −20, needles −6, plates −10 and −20, dendrites −16. (*Same item as* 4.7-160, July 1953, *MAB.*) *Subject Headings:* **1. Snow crystal forms 2. Snow crystal formation 3. Montreal, Canada.**—*C.E.P.B.*

6F–177 551.508.94:551.507.352 551.594.25

Gunn, Ross, **The electrification of cloud droplets in nonprecipitating cumuli.** *Journal of Meteorology*, 9(6):397–402, Dec. **1952.** 3 figs., 8 refs., 9 eqs. **MH-BH**—A cloud analyzer (centrifuge and ion filter) for use on aircraft is described. This was used to measure charges on cloud droplets in small growing cumuli nearly 4500 ft above MSL. On large cloud drops charge was about $+3.8\times10^{-6}$ e.s.u./cc; on air and tiny drops -6.1×10^{-6}/cc. The balance, 2.3×10^{-6}, is attributed to small drops, diameter .01-10μ. (*Same item as* 4.7 42, July 1953, *MAB.*) *Subject Headings:* **1. Atmospheric electricity instruments 2. Electricity of precipitation.**—*C.E.P.B.*

6F-178 551.578.11

Hitschfeld, W. and Gunn, K. L. S. (*McGill Univ., Montreal, Canada*), **Coalescence of large and small water drops.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 13:51–72, May **1952.** 10 figs., 13 refs., eqs. **DWB**—Langmuir-Blodgett's theory of collection of small cloud droplets by larger precipitation particles is reviewed and an experiment conducted with a view of investigating some of its aspects is described. Total increase in the mass of water droplets of 1.59 mm radius falling through a chamber filled with cloud about 3 m high was measured. In comparing experimental with calculated values the author concludes that "(1) Langmuir's aerodynamic theory of collision is valid. (2) Every collision between a drop and a droplet results in coalescence. (3) The phenomena are insensitive to electric charges of the magnitude encountered in nature." Average collection efficiency as a function of cloud droplet radius is also analyzed and graphically presented. (*Same item as* 4.10–210, Oct. 1953, *MAB.*) *Subject Headings:* **1. Raindrop coalescence 2. Langmuir's theory. I. Colloquium on Microwave Meteorology, Aerosols and Cloud Physics.**—*G.T.*

6F–179 551.574:536.421

*Hosler, Charles L. and Hosler, C. Robert, **An investigation of the spontaneous freezing point of small quantities of water.** Pennsylvania. State College, Mineral Industries Experiment Station. Div. of Meteorology, Contract AF19(604)-140, Scientific Report, No. 1, Aug. **1952.** 30 p. 6 figs., 31 tables, 25 refs. **DWB**—Experiments conducted with water in capillary tubes for the purpose of discovering the mechanism of supercooling in clouds are described. Freezing temperature was found to decrease with the decrease of the capillary diameter, which is attributed to changes in the water's atomic structure. Various methods of overcoming this barrier to the formation of ice crystals are discussed. Details of the experiments are tabulated, including data collected from earlier investigators. A curve of spontaneous freezing temperature versus capillary or drop diameter is presented. (*Same item as* 5.5-159, May 1954, *MAB.*) (*See also item* 6F–355.) *Subject Headings:* **1. Freezing point of water 2. Supercooled water.**—*G.T.*

6F–180 551.574.1

Inn, Edward (*U. S. Air Force, Cambridge Res. Center*), **Theory of droplet coagulation.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 13:77–85, May **1952.** 9 refs., eqs. **DWB**—Smoluchowski's classical theory of coagulation is reviewed and his coagulation equation applied to coagulation processes in natural clouds. Effects of surface tension, of electric charges in droplets and of attractive or repulsive forces due to evaporation or condensation are considered. The author also refers to experiments conducted at Columbia University, from which it would appear that not every collision between particles results in a coalescence. (*Same item as*

4.10–192, Oct. 1953, *MAB.*) *Subject Headings:* **1. Coagulation 2. Drop charge 3. Raindrop coalescence. I. Colloquium on Microwave Meteorology, Aerosols and Cloud Physics.**—*G.T.*

6F–181 551.574.1

Johnson, J. C., **Analysis of size distribution of sulfur hydrosols by optical transmission methods.** Massachusetts Institute of Technology. Dept. of Meteorology, Contract AF 19(122)-245, Scientific Report, No. 1, [1952?] 30 p. figs. (some fold.), tables, 3 refs., eqs. **DWB**—The relation of light transmission through hydrosols to optical density, wavelength, drop size distribution and concentration is studied and the application of the method to determination of size distribution of unknown hydrosols and aerosols, including natural clouds, is discussed. The method developed for the computation of mean values of the radius is useful for droplet radii between 200 and 600 mμ. *Subject Headings:* **1. Hydrosol measurements 2. Cloud physics.**—*A.A.*

6F–182 551.574.1

Junge, Christian, **Bemerkungen zur Frage der Eiskeimbildung im frostübersättigten Bereich.** [Remarks on formation of ice nuclei in the frost-supersaturated region.] *Archiv für Meteorologie, Geophysik und Bioklimatologie, Ser. A*, 5(1):44–55, **1952.** 3 figs., 3 tables, 10 refs. German, English, French summaries p. 44–45. **DWB**—Author attempts to bring the modern theories of the operation of freezing nuclei into accord with the observed fact that most condensation nuclei are partly soluble and partly insoluble. He suggests that nuclei are only effective in dilute solutions, and distinguishes between those used in the condensation process and smaller ones which are not (FINDEISEN's types I and II). (*Same item as* 3.11-176, Nov. 1952, *MAB.*) *Subject Heading:* **1. Freezing nuclei.**—*C.E.P.B.*

6F–183 551.574.1

†Junge, Christian, **Die Konstitution des atmosphärischen Aerosols.** [The constitution of atmospheric aerosols.] *Annalen der Meteorologie, Beiheft*, **1952.** 55 p. 42 figs., 12 tables, 40 refs. German and English summaries p. 52–54. **DWB**—This important monograph first summarizes the size distribution of solid and liquid aerosols and discusses the formation of condensation nuclei. Coagulation is especially important and observations suggest that over continents aerosols are usually of mixed origin. Existing methods of counting are discussed from point of view of constitution of aerosols—OWEN's dust counter, ZEISS conimeter and a new procedure for observing size changes of large nuclei with relative humidity. Above 70% they are mainly liquid and grow rapidly. Separation of solid and liquid particles is described. Marine nuclei are mainly salt crystals, continental ones have insoluble residues. Pt. 3 describes measurements of artificial and natural nuclei by a conimeter with 2 nozzles, and Pt. 4 measurements of growth by the spider thread method, which show that large nuclei are of mixed origin. Some electron microscope photographs are included. (*Same item as* 4.3–9, March 1953, *MAB.*) *Subject Headings:* **1. Aerosols 2. Condensation nuclei.**—*C.E.P.B.*

6F–184 551.578.11:551.508.85

Krasnogorskaia, N. V., **Elektronnyĭ umnozhitel' kak pribor dlia izmereniia razmerov chastits osadkov.** [Electronic amplifier as an instrument for measuring the size of precipitation particles.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 5:86–91, **1952.** 2 figs., 7 refs., 6 eqs. **DLC**—Photoelectric method for the measurement of the dimension of moving and resting particles tested under laboratory conditions. Sizes of drops can be measured with an accuracy up to 3%, if the accuracy of the heating current is 0.1% and of the amplifier current 0.2%. Relationship between the size of the drop (d) and the impulse amplitude (V) is $V = Ad^2 + Bd$. A and B depend on experimental conditions. (*Same item as* 5.6–228, June 1954, *MAB.*) *Subject Headings:* **1. Raindrop size measurement 2. Electronic amplifiers.**—*A.A.*

6F–185 551.576.11

Lafargue, Camille (*Centre Nat. de la Recherche Scientifique, France and Puy-de-Dôme Obs.*), **Les principes actuels de la modification artificielle des nuages.** [Present-day principles of the artificial modification of clouds.] *Société des Sciences Naturelles du Maroc, Comptes Rendus des Séances Mensuelles*, No. 3:69–70, **1952.** Abstracted from reprint. Stamped on t-p: *Puy-de-Dôme. Observatoire, Publications, Série B*, No. 4, **1952.** **DWB**—Summary of a lecture delivered at a meeting of the Society of Natural Sciences of Morocco on March 7, 1952 at Casablanca. The physical processes of rain formation, artificial stimulation of rain, and dissipation of clouds, are briefly explained. *Subject Headings:* **1. Cloud modification 2. Cloud physics.**—*G.T.*

6F–186 551.574.1

La Mer, Victor K. and Gruen, Ruth (*Columbia Univ., Dept. of Chem., N. Y.*), **A direct test of Kelvin's equation connecting vapour pressure and radius of curvature.** *Faraday Society, London,*

Transactions, 48(5):410–415, May **1952.** 3 figs., 5 tables, 16 refs., 8 eqs. **DWB**—Although Kelvin's relation (1871) predicting the increase in vapour pressure with increasing curvature is basic to colloid science, e.g., phenomena of capillarity, production and stability of colloidal systems, etc., no unambiguous direct experimental confirmation has ever been obtained. Its acceptance has rested upon the thermodynamic cogency of the derivation and the success of theories based upon it. Our direct verification is based upon an extension of the growth method of measuring the radii of monodisperse aerosol droplets initially too small for accurate determination by light scattering methods. The test involves measuring the extent to which the Kelvin relation controls under equilibrium conditions the growth of monodisperse non-volatile aerosol droplets when exposed to the vapours of a master solution consisting of the non-volatile component plus an excess of a volatile miscible solvent. Excellent quantitative confirmation has been obtained for the systems dioctyl phthalate +toluene and oleic acid +chloroform. (*Same item as* 4.1–166, Jan. 1953, *MAB.*) *Subject Headings:* **1. Vapor pressure over drops 2. Kelvin's equation 3. Drop growth.**—*Authors' abstract.*

6F–187 551.574.1

La Mer, Victor K., **Nucleation in phase transitions.** *Industrial and Engineering Chemistry*, 44(6):1270–1277, June **1952.** 5 figs., 33 refs., 19 eqs. **DLC**—The physical process of nucleation is explained in terms of thermodynamic stability and metastable states, energy and density fluctuations of small elements of volume, phase transition, etc. Vapor pressures and internal pressures of small droplets, phenomena connected with polydispersed and monodispersed aerosols and hydrosols, rate of nuclei formation, heterogeneous nucleation and time lags are discussed and analyzed. The paper is based on theories of J. W. GIBBS, OSTWALD, FARKAS, FRENKEL, VOLMER, BECKER and DÖRING. *Subject Heading:* **1. Condensation nuclei.**—*G.T.*

6F–188 551.577.11:551.576.11:551.574.1

Ludlam, Frank Henry, **The production of showers by the growth of ice particles.** *Royal Meteorological Society, Quarterly Journal*, 78(338):543–553, Oct. **1952.** 6 figs., 18 refs., eqs. **DWB**—Cu clouds are regarded as containing successive rising bubbles of air about 1 km across with well defined upper surfaces but extensive wakes with entrainment. At the top they sink aside and evaporate. The mechanism of growth of nuclei in successive bubbles into raindrops or hailstones is discussed with numerical estimates. An expression for growth of ice particles is evaluated for different radii and temperatures; coagulation exceeds condensation over most of the growth of the precipitation element. Showers should appear with summit temperature −10°C in summer, −20°C in winter. Observations are in general agreement with this. Relation of features determining shower formation in Cu is shown schematically. (*Same item as* 4.2–199, Feb. 1953, *MAB.*) *Subject Headings:* **1. Precipitation formation 2. Ice nuclei.**—*C.E.P.B.*

6F–189 551.576.1

*Malkus, Joanne Starr, **Recent advances in the study of convective clouds and their interaction with the environment.** *Tellus*, 4(2):71–87, May **1952.** 6 figs., refs. p. 86–87. **DWB**—Various originating impulses for cumulus formation are mentioned and how the character of this impulse affects the spacing, scale and temperature structure of the clouds. The possible origins of trade cumuli are considered. Resistive forces which operate against cloud growth, are shown to be of importance in the transports of momentum, moisture and heat and to serve as controls in the feeding of latent energy into the high tropical troposphere. (*Same item as* 3.10–222, Oct. 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Cloud formation 3. Cumulus clouds.**—*From author's abstract.*

6F–190 551.576.11

Malkus, Joanne Starr, **The slopes of cumulus clouds in relation to external wind shear.** *Royal Meteorological Society, Quarterly Journal*, 78(338):530–542, Oct. **1952.** 10 figs., table, 11 refs., 15 eqs. **DWB**—The slope of a cumulus cloud depends on the vertical velocity within the cloud, the external wind shear coupled with the degree of entrainment, and the inertia of the cloud (form drag). These are analyzed, the form drag being equated to a comparable cylinder, and an expression for the cloud slope is derived, and evaluated for various cases. This equation is applied to trade cumulus E of Puerto Rico, and 3 cu clouds over Nantucket Island. Comparison with observed slant shows that considerable entrainment occurs, of the magnitude calculated by STOMMEL (1947). (*Same item as* 4.2–197, Feb. 1953, *MAB.*) *Subject Headings:* **1. Cloud structure 2. Cumulus cloud formation.**—*C.E.P.B.*

6F–191 551.574.1:551.578.11

Mason, Basil John, **Production of rain and drizzle by coalescence in stratiform clouds.** *Royal Meteorological Society, Quarterly Journal*, 78(337):377–386, July **1952.** 4 figs., 14 eqs., 16 refs. **DWB**—Droplets originating on salt nuclei grow by condensation and coalescence, but shrink by evaporation before reaching the ground. Rates of these processes are calculated and it is found that

stratiform clouds sustained by uniform updraft up to 10 cm/sec cannot produce drizzle at the ground. A mechanism is suggested in which most of the cloud droplets are thrown out by turbulence and evaporated, but a few remain in the cloud for 3–4 hours and grow by coalescence into drizzle drops. An appendix treats turbulent diffusion of droplets as a random walk. (*Same item as* 3.11–180, Nov. 1952, *MAB.*) *Subject Headings:* **1. Drizzle 2. Raindrop coalescence 3. Precipitation formation.**—*C.E.P.B.*

6F–192 551.577.11:551.574.1

Mason, B. J., and Howorth, B. P., **Some characteristics of stratiform clouds over North Ireland in relation to their precipitation.** *Royal Meteorological Society, Quarterly Journal*, 78(336):226–230, April **1952.** 2 figs., table, 2 refs. **DWB**—Analysis of St.-cloud thickness and temperature, and surface precipitation, at Aldergrove, showed that drizzle fell mainly from clouds above −5°C and thicker than 2000 ft, suggesting growth by coalescence. Rain or snow fell mainly from clouds with tops below −12°C suggesting ice crystals. Non-precipitating clouds mostly had thickness less than height of their base. (*Same item as* 3.7–156, July 1952, *MAB.*) *Subject Headings:* **1. Rain formation 2. Stratus clouds 3. Aldergrove, North Ireland.**—*C.E.P.B.*

6F–193 551.574.1:536.42

Mason, B. J., **The spontaneous crystallisation of supercooled water.** *Royal Meteorological Society, Quarterly Journal*, 78(335):22–27, Jan. **1952.** 19 refs., 5 eqs. **DWB**—Evaluation of TURNBULL and FISHER's expression (1949) for rate of formation of ice nuclei gives result that nucleation rate increases 9-fold for each degree of temperature fall around −40°C. In a refrigerator very few ice crystals were formed at −39°C, but below −41°C whole cloud became ice in a fraction of a second. This is attributed to freezing of spontaneously formed droplets. Iridescence of mother-of-pearl cloud at −80°C is attributed to small spheres of glassy ice, not water. (*Same item as* 3.4–188, April 1952, *MAB.*) *Subject Headings:* **1. Ice crystal formation 2. Nacreous clouds.**—*C.E.P.B.*

6F–194 551.508.765:551.507.352

NRL develops apparatus for measuring rain drop size. *U. S. Office of Naval Research, Research Reviews*, March **1952.** p. 25. illus. **DWB**—A "disdrometer," an instrument measuring the momentum and thus indirectly the size of raindrops from an aircraft in flight is shown on an annotated photo. (*Same item as* 4.8–55, Aug. 1953, *MAB.*) *Subject Headings:* **1. Disdrometers 2. Airplane observations 3. Raindrop size measurement.**—*G.T.*

6F–195 551.508.765:551.574.7

Neel, Carr B., Jr. and Steinmetz, Charles P., **The calculated and measured characteristics of a heated-wire liquid-water-content meter for measuring icing severity.** *U. S. NACA, Technical Note*, 2615, Jan. **1952.** 59 p. graphs, diagrs., photos., tables, 16 refs. **DWB**—Initial development has been made of an instrument which could be used to obtain statistical flight data on the liquid-water content of icing clouds and to provide a direct indication of icing severity. The sensing element of the instrument consists of wire of known temperature-resistance characteristics which is heated by passing electrical current through it. The wire is mounted in the air stream and the degree of cooling resulting from evaporation of impinging water droplets is a measure of the liquid-water content of the cloud. Comparisons are made of the liquid-water content as measured with heated wires and absorbent cylinders in an artifically produced cloud. Performance characteristics of a heated-wire instrument are presented. (*Same item as* 3.9–62, Sept. 1952, *MAB.*) *Subject Headings:* **1. Icing instruments 2. Icing of aircraft 3. Liquid water content of clouds.**—*Authors' abstract.*

6F–196 551.575.1 551.574:551.511

Petterssen, Sverre, **Condensation caused by mixing.** *Royal Meteorological Society, Quarterly Journal*, 68:167–176, **1952.** 2 figs., table, 5 refs. **DWB**—The amount of condensation caused by mixing under various atmospheric conditions is evaluated: 1) mixing of two parcels of air of widely different temperature may lead to saturation or supersaturation (Bezold effect), 2) horizontal mixing with result directly computed from Bezold effect and 3) vertical mixing with the added adiabatic effect gives lower relative humidity in the lower layers and higher relative humidity aloft. Condensation in 3) depends on (a) the mean specific humidity of the air column, (b) distribution of temperature along the vertical and (c) thickness of the mixing layer. Means of computing condensation level and amount of condensed water are given. (*Same item as* 3F–68, June 1952, *MAB.*) *Subject Headings:* **1. Fog formation 2. Condensation level 3. Mixing ratio.**—*G. C. Bristow.*

6F–197 551.574.1:551.576.11

Phillips, B. B. and Woessner, R. H. (*U. S. Weather Bur.*), **Continuous generation of a cloud for laboratory investigations.** *Journal of Meteorology*, 9(5):370–373, Oct. **1952.** fig., 8 refs., 2 eqs.

MH-BH—An apparatus is shown by which laboratory clouds can be generated by mixing two masses of saturated air at different temperatures. Drop size can be regulated and liquid-water content measured. (*Same item as* 4.4-188, April 1953, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Artificial clouds 3. Cloud chamber experiments.**—*C.E.P.B.*

6F–198 551.574:536.421

Pound, G. M.; Madonna, L. A. and Peake, S. L. (*Carnegie Inst. of Tech., Metals Res. Lab.*), **Critical supercooling of pure water droplets by a new microscopic technique.** Carnegie Institute of Technology. Metals Research Laboratory, Contract AF 19(122)-185, Scientific Report, No. 1, Dec. 1, 1952. 11 p. 5 figs., 19 refs. **DWB.** Also in: *Journal of Colloid Science*, 8(2):187–193, April 1953. **DLC**—Very pure water droplets of 10 to 50 microns in diameter were condensed in silicone oil to form an emulsion. A portion of this emulsion was placed on the specially designed cold stage of a Bausch and Lomb Research Metallograph and cooled to a low temperature. Temperature of the emulsion was measured by a small thermocouple, and freezing of the droplets was detected by observation with polarized light. The supercooling that is critical for ice formation was observed to be $-40\pm2°C$, in agreement with the results of SCHAEFER and of CWILONG. There was usually no marked change in shape of the droplets upon solidification. (*Same item as* 5.5–160, May 1954, *MAB.*) *Subject Headings:* **1. Supercooled water 2. Freezing of water.**—*Authors' abstract.*

6F–199 551.574.1

Pound, Guy M., **Liquid and crystal nucleations.** *Industrial and Engineering Chemistry*, 44(6): 1278–1283, June 1952. 10 figs., 22 refs., 17 eqs. **DLC**—For liquid nucleation from vapor, there is surprisingly good agreement of elementary rate theory with experiment. It is thought that nucleation experiments may be used to study the properties of small aggregates of molecules and to estimate interfacial free energies where one of the phases is a solid. Progress in the study of the kinetics of crystalline nucleus formation in supercooled liquids has been hindered by the fact that it is difficult to prepare liquids that are free of minute solid impurities which may catalyze nucleation, and also that once a supercooled liquid has been seeded, crystallization by growth of the nucleus usually follows rapidly, thus ending the experiment as soon as the first nucleus is formed. The solution of these difficulties recently has led to progress in the quantitative study of the kinetics of this type of nucleation. Developments in heterogeneous and homogeneous nucleation of condensed phases from the supersaturated vapor and in nucleation from supercooled liquids are reviewed. (*Same item as* 4.7–144, July 1953, *MAB.*) *Subject Headings:* **1. Nucleation 2. Supercooled liquids.**—*Author's abstract.*

6F–200 551.578.71

Puzanov, V. P. and Akkuratov, V. I., **K voprosu o mekhanizme obrazovaniia nekotorykh vidov gradii.** [On the mechanism of formation of certain kinds of hailstones.] *Meteorologiia i Gidrologiia*, No. 6:29-33, 1952. 3 figs., 11 refs. **DLC**—Series of special experiments were carried out in the laboratory. It was found that the form, structure and conditions of falling of the hailstones are important factors for investigation of situations by which hailstones were formed. Ice rain must be acknowledged as a winter form of hail. (*Same item as* 4.8–204, Aug. 1953, *MAB.*) *Subject Headings:* **1. Hail formation 2. Hailstones.**—*N.T. Zikeev.*

6F–201 551.574.1

Reiss, Howard (*Boston Univ.*), **Theory of droplet growth.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers*, No. 13, May 1952, p. 40–50. Discussion p. 48-49. 5 figs., 10 refs. **DWB**—The author gives a theoretical analysis of physical properties of a condensation nucleus, of the rate of phase transition and of phase transition in a binary system. The effect of the introduction of various kinds of foreign nuclei is considered. (*Same item as* 4.8–173, Aug. 1953, *MAB.*) *Subject Headings:* **1. Drop growth 2. Condensation nuclei. I. Colloquium on Microwave Meteorology, Aerosols and Cloud Physics.**—*G.T.*

6F–202 551.574.1

Reiss, Howard (*Celanese Corp. of America, Summit, N. J.*), **Theory of the liquid drop model.** *Industrial and Engineering Chemistry*, 44(6):1284–1288, June 1952. 3 figs., 28 refs., 35 eqs. **DLC**—The author reviews the "classical nucleation theory" introduced by VOLMER and FARKAS, developed by BECKER and DÖRING and presented in its most modern form by FRENKEL and ZELDOWICH. In this theory, condensation nuclei are regarded as small liquid incompressible spherical drops, the definition of whose free energy, together with the determination of equilibrium distribution serves as a basis for calculation of the rate of nucleation. After pointing out some shortcomings of this approach, the author introduces his own "statistical theory" of nucleation, based on "the statistical derivation of the equilibrium distribution of embryos." A configuration picture and a curve of the

statistical distribution function are presented. (*Same item as* 4.3–192, March 1953, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Condensation processes.**—*G.T.*

6F–203 551.574:551.578.41

Reynolds, S. E., **Ice-crystal growth.** *Journal of Meteorology*, 9(1):36–40, Feb. **1952.** 12 figs., table, 4 refs. **MH-BH**—Describes a laboratory study of rate of ice crystal growth in supercooled clouds at −20 to −16°C seeded with dry ice. Diagrams show frequency distributions of snowflake diameters after 10–165 sec, relations between thickness and density, and growth of mass with time; they agree well with HOUGHTON's calculations. It is considered that a convective cloud might be effectively seeded from ground by a very little silver iodide but overseeding is unlikely. (*Same item as* 3.9–181, Sept. 1952, *MAB.*) *Subject Headings:* **1. Ice crystal formation 2. Cloud seeding.** —*C.E.P.B.*

6F–204 551.574.1:551.508.91 551.594.22

Reynolds, S. E., **Thunderstorm electricity.** New Mexico Institute of Mining and Technology. Research and Development Div., Contract DA 399-07-022, Report No. 5; Progress Report, Nov. 15, 1949–Feb. 15, 1950, March 27, **1950,** and Report No. 6, Quarterly Report for period ending Nov. 7, 1952, Nov. 22, **1952.** 2 pieces. tables, figs., refs. Report No. 5, Appendix: Workman, Everly J. and Reynolds, S. E., **Photograph of an unusual lightning discharge.** 2 photos. **DWB**—In Report No. 5 the following experiments are described. Cold boxes were constructed and installed in aircraft for collecting and counting sublimation nuclei over the Great Basin and Rockies on flights from Albuquerque to Boise to Reno, and back to Albuquerque, in order to compare counts aloft with surface counts made at Socorro, N. Mex. Results were unreliable because of accidental seeding in the cold box by frost dislodged from the box walls in flight. Ammonia increases effectiveness of AgI as sublimation nuclei by 2 orders of magnitude. Lead iodide forms sublimation nuclei at temperatures below −17°C. Report No. 6 gives details of a method of determining location, sign, and magnitude of charge centers involved in lightning discharges. Equipment and records are illustrated. *Subject Headings:* **1. Cloud physics research 2. Sublimation nuclei counters 3. Airplane instrumentation 4. Lightning 5. Rocky Mountains.**—*M.R.*

6F–205 551.575.1:551.571.1

Rodebush, Worth H. (*Univ. of Ill.*), **Spontaneous nucleation in supersaturated water vapor.** *Industrial and Engineering Chemistry*, 44(6):1289–1291, June **1952.** fig., table, 4 refs., 16 eqs. **DLC**—GIBBS showed that no stable equilibrium, such as has been assumed in the derivation of the Thomson equation, can exist between the liquid drop and the vapor phase. When the drop becomes small enough, it behaves like a large molecule and below a certain critical size the translational and rotational entropies contribute a stabilizing factor which makes equilibrium possible. It is assumed that the equilibrium concentration of these aggregates or clusters are present at all times. The equilibrium concentration decreases with increasing cluster size. When the supersaturation is increased to a point where a considerable concentration of the critical size is present, condensation occurs immediately. The theory appears to agree with the reported facts for water vapor, but more reliable data are needed. (*Same item as* 4.7–145, July 1953, *MAB.*) *Subject Headings:* **1. Nucleation 2. Supersaturation 3. Water vapor.**—*Author's abstract.*

6F–206 551.508.91

Schaefer, Vincent J. (*Gen. Elec. Res. Lab. Schenectady*), **Continuous cloud chamber.** *Industrial and Engineering Chemistry*, 44(6):1381–1383, June **1952.** 2 figs., 8 refs. **DLC**—The author describes two types of continuous cloud chambers (a nuclei-free and an open-base chamber) which he developed to supplement the ordinary cold chamber for studying atmospheric processes related to warm, cool and cold clouds. Schematic diagrams of the two chambers are presented. The continuous cloud chamber is particularly suited for studying growth of ice crystals, effect of dry ice seeding and formation of silver iodide particles. (*Same item as* 4.4–57, April 1953, *MAB.*) *Subject Heading:* **1. Cloud chambers.**—*G.T.*

6F–207 551.574.1:551.578.41

Schaefer, Vincent J., **Formation of ice crystals in ordinary and nuclei-free air.** *Industrial and Engineering Chemistry*, 44(6):1300–1304, June **1952.** 7 figs., 18 refs. **DLC**—Previous experiments showed that at −39°C large numbers of ice crystals form when an attempt is made to produce a supercooled cloud. Recent studies using ordinary and nuclei-free air to explore the factors that control the formation of ice crystals at various temperatures are described. The results indicate the relationship of freezing and fragmentation nuclei to the initial formation of ice crystals. The relationship of these findings to the formation of snow in the atmosphere is briefly mentioned. (*Same item as* 4.4–189, April 1953, *MAB.*) *Subject Headings:* **1. Ice crystal formation 2. Nuclei-free air.** —*Author's abstract.*

6F–208 551.578.71

Shishkin, N. S., **Issledovanie rosta sfericheskogo grada.** [Investigation of the growth of spherical hail.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geofiz.*, No. 6:73–78, **1952.** 5 figs., 4 refs., 9 eqs. **DLC**—Hail is formed as a result of the freezing of cloud droplets when clouds ascend and the temperature falls. The method for calculating the growth of droplets is described and the formula used for calculating the growth of large spherical ice particles is:

$$\Delta_i = \frac{1}{4}\frac{\rho_w}{\rho_i}\left(1+\frac{u}{v}\right)q_w\Delta_z,$$

where ρ_w and ρ_i are the density of water and ice, respectively; v—velocity of fall of ice particles relative to air; q_w—liquid content of cloud. The results of calculations show that large hail stones can be formed at small but continuous velocity of the ascending currents. (*Same item as* 5.6–233, June 1954, *MAB.*) *Subject Headings:* **1. Hail formation 2. Spherical hail.**—*I.L.D.*

6F–209 551.577.11

Shishkin, N. S., **K teorii letnikh osadkov.** [Contribution to the theory of summer precipitation.] *Meteorologiia i Gidrologiia*, No. 7:17–22, **1952.** fig., 12 refs., 6 eqs. **DLC**—The author noticed an inaccuracy of the Bergeron and Findeisen theory by which the formation of precipitation is possible only when ice particles appear between water drops in clouds. The original quantitative theory of precipitation falling out from water clouds is presented. Special investigations of growth of cloud drops were carried out during 1946–1948 at the Central Geophysical Observatory under supervision of E. S. Selezneva, which showed that the formation of ice particles in clouds stimulated precipitation, but this is not determinant in cases of anabatic flow. It was observed also, that intensive precipitation may fall from clouds above the freezing point. (*Same item as* 4.11–217, Nov. 1953, *MAB.*) *Subject Headings:* **1. Precipitation formation 2. Rain from nonfreezing clouds 3. Bergeron-Findeisen theory.**—*N. T. Zikeev.*

6F–210 551.508.765:551.578.11

Smith, L. G. (*Imperial Coll., London, Eng.*), **New method to measure raindrop size.** *Illinois. State Water Survey Div., Bulletin*, No. 41:299, **1952.** **DWB**—A method worked out at Cambridge, Eng., for measuring size of raindrops by change in capacity of a parallel plate condenser when a drop falls between the plates. The effect of the drop being to produce a change of frequency in the circuit of an oscillator (120 Mcps). The signal is reduced first to 10 Mcps and then to 0.5 Mcps, the frequency deviation being unaltered, and detected in a phase discriminator. In this way a voltage pulse is obtained which is proportional in magnitude to the mass of the drop. (*Same item as* 4.8–56, Aug. 1953, *MAB.*) *Subject Headings:* **1. Raindrop size measurement 2. Raindrop size meters.**—*From author's abstract.*

6F–211 551.508.765

Squires, P. and Gillespie, C. A., **A cloud-droplet sampler for use on aircraft.** *Royal Meteorological Society, Quarterly Journal*, 78(337):387–393, July **1952.** 4 figs., 9 refs. **DWB**—A glass rod 3 mm diameter and 25 cm long coated with magnesium oxide is shot out by a spring and withdrawn in 1/30 sec. A magazine carries 10 rods and can be reloaded in 40–50 sec. Collection efficiency, calibration and interpretation discussed and some specimen histograms from a cumulus given. Calculated liquid water content less than adiabatic value. (*Same item as* 3.11–65, Nov. 1952, *MAB.*) *Subject Headings:* **1. Drop size meters 2. Water content of clouds.**—*C.E.P.B.*

6F–212 551.574.1:551.576.11 551.578.11

*†Squires, P., **The growth of cloud drops by condensation, Pt. 1. General characteristics.** *Australian Journal of Scientific Research, Ser. A. Physical Sciences*, 5(1):59–86, March **1952.** 6 figs., 5 tables, 21 refs. **Pt. 2. The formation of large cloud drops.** *Ibid.*, 5(3):473–499, Sept. **1952.** tables, eqs. **DWB**—In Pt. 1 the effect of ventilation on drop growth due to falling velocity is formulated. Transfer of heat and water vapor, heat balance of a drop, equation of growth, growth of cloud under adiabatic assumption, characteristics of condensation processes in a cloud, approximate value for supersaturation, relative magnitude of lag term which is neglected, growth of small droplets, growth of large droplets and, finally, definition of M, the measure of nucleus size for small nuclei are discussed in quantitative terms. In Pt. 2 conditions for the growth of some drops to a relatively large size by condensation are investigated theoretically. This requires that in some air parcels an undue proportion of the available water vapor should condense on relatively few nuclei. The types of vertical motion and nucleus spectra which could yield this result are investigated. It is found that very large cloud drops can be formed by condensation under conditions which, on present knowledge, seem likely to occur at times, but not normally. The hypothesis that the factors studied here largely determine colloidal stability in nonfreezing cloud is therefore satisfactory, inasmuch

as it leaves room for both stability and instability. (Pt. 1 *same item as* 4.2–187, Feb. 1953, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Drop growth 3. Condensation nuclei 4. Rain from nonfreezing clouds.**—*M.R. and from author's abstract.*

6F–213 551.574.1

Turnbull, David and Vonnegut, Bernard (*General Electric Research Lab., Schenectady*), **Nucleation catalysis.** *Industrial and Engineering Chemistry*, 44(6):1292–1298, June **1952.** 6 figs., 4 tables, 32 refs., 24 eqs. **DLC**—It is known that the structures of crystals and the substances that catalyze their formation closely resemble each other in atomic arrangement and lattice spacing on certain low index planes. A crystallographic theory of crystal nucleation catalysis predicts that the order of catalytic potency should be identical with the order of the reciprocal of the disregistry $(1/\delta)$ between the catalyst and forming crystal on low index planes of similar atomic arrangement; that for small δ nuclei should form coherently with the catalyst —i.e., with a strain $\epsilon = \delta$; and that for δ very large $\delta \gg \epsilon$ and the interface between nucleus and catalyst can be thought of as consisting of regions of good fit separated by a dislocation grid work. The energy of this interface should be proportional to the dislocation density, hence to $\delta - \epsilon$. There is evidence that ice nuclei may form coherently on silver iodide surfaces ($\delta = 0.0145$). Experience indicates that in general nuclei form coherently with catalysts only for $\delta \lesssim 0.005$ to 0.015. (*Same item as* 4.7–146, July 1953, *MAB.*) *Subject Headings:* **1. Nucleation 2. Ice crystal formation 3. Silver iodide.**—*Author's abstract.*

6F–214 551.574.1

Vujičić, K., **O kundenzacionim jezgrima.** [Condensation nuclei.] *Yugoslavia. Hidrometeorološka Služba, Vesnik*, 1(3/4):59–62, July/Oct. **1952. DWB**—The mechanism of the condensation of water vapor on atmospheric nuclei is explained in non-technical terms. *Subject Heading:* **1. Condensation nuclei.**—*G.T.*

6F–215 551.578.11

Ward, R., **Rain from non-freezing cloud.** *Meteorological Magazine*, London, 81(956):56–57, Feb. **1952.** fig., 2 photos. **DWB**—Describes case of May 22, 1945, in 43.1 N, 14.3 W, with tephigram. Photos show 10/10th Nb St, 940–760 mb, freezing level 740 mb. (*Same item as* 3.6–146 June 1952, *MAB.*) *Subject Heading:* **1. Rain from nonfreezing clouds.**—*C.E.P.B.*

6F–216 551.508.765:551.574:551.576.11

Warner, J. and Newnham, T. D., **A new method of measurement of cloud-water content.** *Royal Meteorological Society, Quarterly Journal*, 78(335):46–52, Jan. **1952.** 6 figs., 6 refs. **DWB**—In a new instrument, attached to the wing of an aircraft, a 1 in. paper tape is driven past a 0.1 in. slit open to the air stream and resistance across tape measured by a milliammeter. It was calibrated in a wind tunnel. Records indicate rapid variations of water content up to 0.4 gm/m^3 in a few hundred ft and increase with height to near cloud top. (*Same item as* 3.4–68, April 1952, *MAB.*) *Subject Heading:* **1. Water content of clouds.**—*C.E.P.B.*

6F–217 551.574.1:551.578.41

*Wexler, Raymond and Boucher, Roland J., **Heat balance of a growing ice particle.** Mount Washington Observatory, Contract AF 19(122)-399, Scientific Report, No. 2, June 30, **1952.** 7 p. 2 figs., 3 tables, 4 refs. **DWB**—The heat balance equation for ice crystals growing at water saturation at temperatures between 0 and −30°C is solved for different saturated adiabats. The maximum rate of growth of ice crystals is found to occur at −18°C to −20°C. (*Same item as* 4.6–165, June 1953, *MAB.*) *Subject Heading:* **1. Ice crystal formation.**—*Authors' abstract.*

6F–218 551.574.1:551.501.81

Wexler, Raymond and Boucher, Roland J., **Theoretical studies related to the growth of precipitation particles, and empirical studies and statistical analyses of particle size distributions in rain and clouds and their relationship to radar reflectivity.** Mount Washington Observatory, Contribution to the theory of the constitution of clouds, Contract AF 19(122)-399, Final Report, July 31, **1952.** 4 p. refs. **DWB**—This report summarizes six papers prepared under the above quoted contract during the period Oct. 1950–July, 1952. The papers appeared in quarterly progress reports and in scientific reports of the contractor. The subjects covered are the effect of coalescence on drop size distribution, radar echoes from thunderstorms, heat balance of growing ice particles, nylon screen for measuring drop size distribution, and radar reflectivity as a function of rainfall intensity, of drop size distribution and of liquid water content. (*Same item as* 4.8–174, Aug. 1953, *MAB.*) *Subject Headings:* **1. Drop size distribution 2. Drop growth 3. Radar analysis of precipitation 4. Coalescence 5. Liquid water content of clouds.**—*G.T.*

6F–219 551.574.1

*Woodcock, Alfred H., **Atmospheric salt particles and raindrops.** *Journal of Meteorology*, 9(3):200-212, June **1952.** 16 figs., 7 tables, 31 refs. Also: McDonald, James E.; Woodcock, A. H., **Remarks on "Atmospheric . . . ."** *Ibid.*, 10(2):165-166, April **1953. DWB**—Atmospheric sea salt data are presented in the form of distribution curves which show the number of sea salt particles (of a given weight range) sampled at different altitudes plotted against the weight. Computations show that "in the process of growth the droplets containing each salt particle grow to raindrop size through coalescence with much more numerous and relatively non-saline droplets. The numbers of droplets in cumulus clouds over the sea are compared to the numbers of condensation nuclei in the sub-cloud layer and to the number of larger sea-salt particles. A method (of sampling the large sparsely-distributed salt particles in the atmosphere) is described briefly." McDonald questions Woodcock's hypothesis that large salt particles grow to raindrop size by coalescence. Woodcock replies. (*Same items as* 3.11 184, and 4.11–203, Nov. 1952 and Nov. 1953, *MAB.*) *Subject Headings:* **1. Saline nuclei 2. Condensation nuclei 3. Raindrops.**—*M. P. Kramer, C.E.P.B.*

6F–220 551.574.1:548

Wylie, R. G., **The condensation of a vapour at a crystalline surface.** *Australian Journal of Scientific Research, Ser. A, Physical Sciences*, 5(4):628–646, Dec. **1952.** fig., table, 24 refs., 33 eqs. **MH-BH**—The theory of self-nucleation in a supersaturated vapour has been developed with considerable success by Becker and Döring (1935), but little attention has hitherto been given to condensation at a solid surface. A theory is given for the nucleation of liquid condensates on a plane surface and at lines and corners formed by the intersection of plane surfaces. It is suggested that the line and corner sites are representative of typical features of real crystalline surfaces. The equilibrium properties and free energies of formation of embryos at these sites, which are required for the nucleation theory, have been given in the previous paper. The theory shows that the supersaturation for which nucleation proceeds at a just observable rate on a plane surface increases rapidly as the contact angle increases from zero. Unless an edge free energy is introduced, no supersaturation is necessary for nucleation at a line or corner of intersection of plane surfaces when the contact angle is less than a threshold value which depends on the angles between the planes. As the contact angle increases above the threshold value the supersaturation required for observable condensation increases considerably. The effect of contamination of the substrate surface is considered and the suggestions are made that, if a small amount of soluble contamination is present it is likely to become localized at surface steps and corners, sensitizing them as nucleation sites, and that microscopic observation of incipient condensation on solid surfaces may provide a tool for the investigation of surface structure. (*Same item as* 5.1–218, Jan. 1954, *MAB.*) *Subject Heading:* **1. Condensation nuclei.**—*Author's abstract.*

6F–221 551.574.1

Wylie, R. G., **The properties of liquid phase embryos at the interaction of plane solid surfaces.** *Australian Journal of Scientific Research, Ser. A, Physical Sciences*, 5(4):618–627, Dec. **1952.** 2 figs., 12 refs., 22 eqs. **MH-BH**—In order to calculate the probabilities of nucleation of liquid droplets at different types of site of a solid surface, the properties of embryonic droplets which may exist in complete thermodynamic equilibrium at those sites must be known. The general properties of liquid embryos formed on a plane solid surface, or at lines or points of intersection of plane solid surfaces are considered. It is shown that, although an edge free energy associated with the boundary line may substantially affect the properties of embryos at small contact angles, the effect is probably not large, for embryos of the sizes of interest, when the contact angle is larger than about $\pi/4$. The areas, volumes, total surface free energies, and free energies of formation are found for embryos at these sites as functions of the contact angle, any edge free energies being neglected. The extension to the formation of bubbles at plane solid surfaces in a pure liquid is indicated. The results are applied in a following paper (item 6F–200) to the kinetics of condensation of vapor at an imperfect crystalline surface. (*Same item as* 5.6–206, June 1954, *MAB.*) *Subject Heading:* **1. Condensation nuclei.**—*Author's abstract.*

6F–222 551.578.41

Yamamoto, Gi-ichi; Ogiwara, Sekiji; Yoshida, Kanji and others, **Observations of the rate of growth of ice crystals artificially produced in the atmosphere.** *Tohoku Univ., Science Reports, 5th Ser., Geophysics*, 4(2):83–87, Oct. **1952.** figs., 2 tables, 5 photos., 7 refs. **MH-BH**—Experiments conducted under natural conditions on Mt. Zao in northern Honshu from March 1 to March 8, 1952, are reported. A spray nozzle generator was used for atomizing an acetone solution of silver and sodium iodide with compressed hydrogen. Supercooled cloud droplets and ice crystals were captured at several sites and examined with electron microscopes. A day-by-day account of operations and of meteorological conditions is given. Data on results and microphotographs of ice crystals and water droplets are presented. The authors find evidence indicating that ice crystals were actually

produced in the seeding operations and that these grow by sublimation at the rate determined in Houghton's calculations. (*Same items as* 4.9–192, Sept. 1953, *M.A.B.*) *Subject Headings:* **1. Ice crystal formation 2. Laboratory experiments. I. Miura, Akira II. Ôkita, Toshi-ichi III. Ohtake, Takeshi.**—*G.T.*

6F–223 551.576.11:551.501.7:534

Zanotelli, Guglielmo (*Rome, Ist. Naz. di Geof.*), **Sondaggio acustico delle nubi.** [Acoustical sounding of clouds.] *Annali di Geofisica*, 5(1):55–76, Jan. **1952.** 10 figs., 3 refs. English summary p. 75–76. **MH-BH**—An elaborate analytical method is found for determining reflection indexes of waves at various frequencies in the audible scale as functions of droplet size and number in the reflecting cloud. Values of audibility of the reflected sound with and without an amplifier are calculated. It is pointed out that this method of estimating drop size and number by recording the intensity of reflected sounds at varying frequencies should be very useful in observing quick changes taking place in a cloud owing to evaporation, condensation, cohesion, etc., particularly during stormy conditions. (*Same item as* 4.3–210, March 1953, *M.A.B.*) *Subject Headings:* **1. Acoustical soundings 2. Cloud physics 3. Drop size distribution.**—*G.T.*

1953

6F–224 551.578.11

Adderley, E. E., **The growth of raindrops in cloud.** *Royal Meteorological Society, Quarterly Journal*, 79(341):380–388, July **1953.** 6 figs., 6 tables, 7 refs. **DWB**—In the C.S.I.R.O. Radiophysics Laboratory, Sydney, Australia, a balloon-borne microphone is frequency modulated by impinging raindrops and transmits a continuous sampling of raindrop size to base. Technique of interpreting records is described. Results for different heights are shown in tables and graphs. Rate of growth of drops falling through a cloud is found to increase with drop diameter 3–4 times as fast as previously computed rates. (*Same item as* 4.11–224, Nov. 1953, *M.A.B.*) *Subject Headings:* **1. Drop accretion 2. Raindrop size measurement.**—*C.E.P.B.*

6F–225 551.577.11:551.509.311

Armstrong, G. R., **A synoptic study of precipitation in eastern North America.** *Canada. Meteorological Division, Circular*, 2301, Tec. 151, May 27, **1953.** 27 p. tables, refs. **DWB**—Theories accounting for the growth of drops or crystals in natural clouds by (a) additional condensation on the drop surface or (b) coagulation are reviewed briefly. With a view to verifying such theories, the author correlates precipitation observed in connection with some 200 depressions (eastern North America, Oct. 1945–May 1946) with various properties of the overrunning warm air sector, such as potential instability, position of the subfreezing levels, type of frontal surface, strength of overrunning and origin of the overrunning air mass. Results of the correlation analysis are tabulated. The author concludes that the statistical analysis fails to reveal a predominant influence of any of the processes suggested as decisive by the theories investigated. It would appear that such processes are only a few among those which combine in producing precipitation. *Subject Headings:* **1. Precipitation analysis 2. Cloud physics 3. Rain formation 4. Synoptic studies.**—*G.T.*

6F–226 551.578.11

Atlas, David and Plank, Vernon G., **Drop-size history during a shower.** *Journal of Meteorology*, 10(4):291–295, Aug. **1953.** 3 figs., table, 8 refs., 2 eqs. **MH-BH**—Five drop-size spectra at 1½–2 min. intervals during a shower at Watertown, Mass., shown by histograms, indicate a steady decrease of median volume diameter d_0 from 1.8 to 0.3 mm. Distribution agrees with computed expression $d_0 = 0.92\ R^{0.21}$, except for first drops, but reflectivity is only half that predicted by $Z = 200\ R^{1.6}$ (R, rate of rainfall). Results are interpreted in terms of physical history of raindrops. (*Same item as* 5.6–227, June 1954, *M.A.B.*) *Subject Heading:* **1. Raindrop size distribution.**—*C.E.P.B.*

6F–227 551.574.1:536.421

Bigg, E. K., **The supercooling of water.** *Physical Society of London, Proceedings, Sec. B*, 66(8):688–694, Aug. 1, **1953.** 3 figs., 13 refs., 3 eqs. **DWB**—Freezing temperatures of water drops diameter 50 microns to 2.5 cm at the interface of two insoluble liquids were measured by thermocouple. Freezing point increased linearly with log drop diameter. For 1 mm drops it varied from −20 to −28°C, most frequent at −24°C. Rate of cooling has a small but real effect, more rapid cooling giving greater supercooling. The interrelations between freezing point, volume and time are also derived theoretically and found to be consistent with the observations. Earlier experimental data are compared and discussed. (*Same item as* 5.3-239, March 1954, *M.A.B.*) *Subject Heading:* **1. Supercooled water.**—*C.E.P.B.*

6F–228 551.574.1:536.42

Bigg, E. K., **The formation of atmospheric ice crystals by the freezing of droplets.** *Royal Meteorological Society, Quarterly Journal*, 79(342):510–519, Oct. **1953.** 2 figs., 4 tables, 22 refs.,

3 eqs. **DWB**—Referring to his paper **The supercooling of water** (*see item* 6F-227), author examines expansion-chamber experiments of FINDEISEN and SCHULZ and concludes that all the main features can be explained without ice-nuclei. The processes of ice formation in cirrus, stratus and cumulus are discussed, and it is concluded that, especially below −20°C, freezing nuclei may be less important than previously supposed. Where frequency of ice crystals is excessive, they may be due to contamination by industrial smoke. (*Same item as* 5.3–240, March 1954, *MAB.*) *Subject Headings:* **1. Freezing of cloud droplets 2. Ice crystal formation.**—*C.E.P.B.*

6F–229 551.508.765:551.574.7:629.13

Bigg, F. J. and Abel, G. C., **Note on sampling and photographing cloud droplets in flight.** *Farnborough, England. Royal Aircraft Establishment, Technical Note,* No. MECH. ENG. 156, **1953.** 17 p. 14 figs., table, 6 refs. **GB-MO**—An oiled slide apparatus is described for measuring the size and distribution of supercooled water droplets causing icing of airplanes. It includes a sampling pole with 5 oiled slides and a photomicrographic camera. Calibration and method of operation are described; the apparatus proved reasonably reliable. A number of photomicrographs are shown, including a study of the melting process of ice crystals. (*Same item as* 6.3–59, March 1955, *MAB.*) *Subject Headings:* **1. Drop size distribution instruments 2. Icing of aircraft.**—*C.E.P.B.*

6F–230 551.578.11

Blanchard, Duncan C., **Raindrop size-distribution in Hawaiian rains.** *Journal of Meteorology,* 10(6):457–473, Dec. **1953.** 13 figs., 2 tables, 36 refs. Also: **Raindrop size distribution and associated phenomena in Hawaiian rains.** Woods Hole Oceanographic Institution, Contract Nonr-798(00) (Nr-085-001), Technical Report, No. 4, Dec. **1952.** 21 p. fig., tables, refs. **MH-BH, DWB**—Filter paper samples of drop size distribution in orographic rains from non-freezing clouds at cloud base or within the cloud gave narrow distributions, largest drops rarely exceeding 2 mm diameter and drops >0.5 mm often exceeding 25,000/m³. These give low values of median drop diameter and radar reflectivity but high liquid-water content. Regression equations for median diameter, water content, radar reflectivity and rate of rain are obtained for different situations. (*Same item as* 5.7–159, July 1954, *MAB.*) *Subject Headings:* **1. Raindrop size distribution 2. Hawaiian Islands.**—*C.E.P.B.*

6F–231 551.574.1

Boston Univ. Dept. of Chemistry, **Role of surface forces in the adsorption of water vapor on foreign nuclei,** by Coulter, Lowell V. Contract AF 19(122)-361, Final Report, **1953?** 18+p. 16 tables, 16 figs., 25 refs. **DWB**—The adsorption isotherms of water on AgI, PbI_2 and BaF_2 have been determined at 0 and 25°C. For comparison purposes the surface areas of the samples employed in the water adsorption measurements, and Ag_2S in addition, have been determined in the usual manner by nitrogen adsorption at −195.8°C. As is usually found to be the case for ionic solids, the adsorption of water on BaF_2 was found to follow the usual type of isotherm for ionic solids which in general display heats and entropies of adsorption of water greater than the corresponding functions for bulk condensation thereby revealing strong ion dipole forces that result in marked orientation (relative to bulk phase) of the molecules of the adsorbed phase. In contrast to this general behavior, the adsorption of water on AgI and PbI_2 is characterized by a smaller heat and a less negative entropy of adsorption than is observed for the condensation of bulk water. Energies of adsorption calculated with the aid of the BET theory likewise indicate a larger heat of absorption of water on the ionic solid BaF_2 than on the covalently bonded AgI and PbI_2. (*Same item as* 5.7–136, July 1954, *MAB.*) For Reports No. 1 and 4 on this contract (1951) *see items* 3.4–185 and 4.1–165, April 1952 and Jan. 1953, *MAB. Subject Headings:* **1. Adsorption of water vapor 2. Condensation mechanisms 3. Condensation nuclei. I. Coulter, Lowell V.**—*From author's abstract.*

6F–232 551.577.32:551.590.25(94)

Bowen, E. G., **The influence of meteoritic dust on rainfall.** *Australian Journal of Physics,* Melbourne, 6(4):490–497, Dec. **1953.** 5 figs., 2 tables, 6 refs. **MH-BH**—An examination of daily average rainfall for Sydney, Australia for (a) 1859–1901 and (b) 1902–1944, and comparable data from British Indies and elsewhere, leads the author to advance the hypothesis that the source of anomalous rainfall peaks on or about the 12–13, 23 and 31 of Jan. is extraterrestrial since the effect is worldwide. The fact that these peaks occur about 29 days after the meteor showers of Dec. 13–14, 22 and Jan. 3 leads him to believe that these showers of meteoric dust are responsible. About 10,000 tons of meteoric dust in the $<4\mu$ size ranges falls on the earth each day and the velocity of settling is >1 cm/sec below 100 km height, thus taking 30–50 days to settle to the 40,000 or 50,000 ft level due to deceleration of fall velocity, seems to be highly correlated with occurrence of noctilucent clouds. *Subject Headings:* **1. Rainfall singularities 2. Meteoric dust effects 3. Noctilucent clouds 4. Sydney, Australia.**—*M.R.*

6F–233 551.574.1:551.594.2(02)

†Bricard, Jean, **Physique des nuages.** [Cloud physics.] Paris, Presses Universitaires de France, **1953.** 343 p. 89 figs., 8 plates (photos.), bibliog. p. 329–332. *"Euclide" series.* **DLC**—A complete, detailed and systematic treatment of many aspects of cloud physics from the modern point of view. The chapters comprise: 1) Classification and methods of observation; 2) Properties of air masses (stability and instability); 3) Formation of clouds in homogenous air masses; 4) Orographic and frontal clouds; 5) Clouds of water droplets, supercooled clouds; 6) Ice crystal clouds; 7) Precipitation formation; 8) Diffusion of light by clouds; 9) Transmission of radiation by clouds; 10) Electric field of clouds; 11) Clouds and electric currents in atmosphere; 12) Origin of electricity in clouds; 13) and 14) Lightning structure, spectra and photography; 15) Lightning mechanism. The book is full of illustrative schematic diagrams and theory (clearly presented), and reviews most of the recent work in this field—especially in the field of atmospheric electricity connected with clouds and thunderstorms. (*Same item as* 6.2–1, Feb. 1955, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Thunderstorm electricity 3. Textbooks.**—*M.R.*

6F–234 551.574.1

Brooklyn. Polytechnic Institute, **Theoretical investigation of the growth of aerosol particles.** Contract AF 19(122)-412, Reports No. 1–3, Feb. 1–Oct. 1, **1951.** 3 pieces. refs., eqs. Also its: Final Report [**1953**]. 35 p. 2 tables, 23 refs., 77 eqs. **DWB**—In Reports 1 and 2 the solutions for moving sink (droplet) boundary diffusion problem is given for the special case when the product of initial concentration and the specific growth constant of the boundary is < unity. In Report 3 the approximate solution is given in one dimension for the case when that product is > unity. The presence of a multiplicity of sinks in the diffusion field when it leads to final collapse of the aerosol supersaturation is also dealt with and a simple equation presented for calculation of this effect. In the Final Report Fick's diffusion law is applied to the growth of aerosols under appropriate boundary conditions with due regard to the changing vapor pressure of the droplet and the effects of gravity and turbulence. (*Same item as* 5.3–245, 5.8–191 and 5.10–174, March, Aug. and Oct. 1952, *MAB.*) *Subject Headings:* **1. Drop diffusion 2. Drop accretion 3. Condensation nuclei. I. Frisch, H. L. II. Collins, F. C.**—*From authors' abstracts.*

6F–235 551.574.1:551.576.1

Brun, Rinaldo J. and Mergler, Harry W., **Impingement of water droplets on a cylinder in an incompressible flow field and evaluation of rotating multicylinder method for measurement of droplet-size distribution, volume-median droplet size, and liquid-water content in clouds.** *U. S. NACA, Technical Note,* 2904, March **1953.** 71 p. 19 figs. (2 fold in pocket), 4 tables, 15 refs., eqs. **DWB**—The trajectories of water droplets in an incompressible flow field around a cylinder were calculated with a mechanical analog. The collection efficiency, the area of droplet impingement on the cylinder, and the rate of droplet impingement were determined from the trajectories. An evaluation of the rotating multicylinder method for the measurement of droplet-size distribution, volume-median droplet size, and liquid-water content was made based on the results of the trajectory calculations. (*Same item as* 5.3–242, March, 1954, *MAB.*) *Subject Headings:* **1. Drop size distribution 2. Liquid water content of clouds.**—*NACA abstract.*

6F–236 551.594.2

Thunderstorm electricity. Horace R. Byers (*ed.*). Chicago, Univ. of Chicago Press, **1953.** 344 p. figs., tables, refs. at end of each chapter, eqs. Price: $6. **DLC, DWB**—A compendium of articles (by Byers, Gunn, Weickmann, Norinder, Kuettner, Workman, Loeb, Gish, Israël and others) on various aspects of thunderstorm electricity and associated phenomena, most of which were read at the conference on thunderstorm electricity in April 1950 at the University of Chicago with the support of G.R.D. Some of these papers are reviewed separately in this bibliography (*see* 6F–281 and 6F–363) and others have been abstracted previously. Subject matter in this important volume included: Ch. II, origin of atmospheric electric field; Ch. IV, thunderstorm structure and dynamics; Ch. V, precipitation forms in cumulus-nimbus clouds; Ch. VI, structure and electrification of clouds; Ch. VII, charge generation; Ch. VIII, measurement of electric charges on precipitation, Ch. IX, electrification and rain and snow particles; Ch. X, aircraft measurements of charges carried to the ground; Ch. XI, lightning measurements of charges; Ch. XIII, sferics from thunderstorms, etc. (*Same item as* 4.10–12, Oct. 1953, *MAB.*) *Subject Headings:* **1. Thunderstorm electricity. I. Byers, Horace R.** (*ed.*).—*M.R.*

6F–237 551.574.1:551.578.41

*Commonwealth Engineering Co. of Ohio, Dayton, **Ice physics program.** Contract AF 33(616)-127, Quarterly Reports, Nov. 1952 through April 1953; Reports No. 3 and 4, **1953.** 53+62 p. 108 tables, 7 refs. **DWB**—Research concentrated on problems of nucleation in supercooled bulk water and crystallization processes. A great number of contaminants that influence nucleation

temperature are examined and experimental results given. Silver iodide raised the nucleation temperature by 15–16°C, silicon carbide by 13.7°C, graphite by 11.5°C. The greatest lowering (−3.5°C) was achieved by carbon dioxide. Data were obtained for the linear crystallization rate of ice in water supercooled from −2.8 to −5.8°C. It is tentatively suggested that the type of surface and the rate of flow of heat from the surface may have a distinct influence on the nature of the ice crystal formed and that this may influence the forces acting at the adhesive interface. *Subject Headings:* **1. Ice physics 2. Ice crystal formation 3. Ice nuclei.**—*A.A. and from authors' abstract.*

6F–238 551.574.1

Dessens, H., **À propos d'un rapport de B. Vonnegut concernant l'utilisation de films minces de solutions sursaturées pour la détection, le comptage et l'identification de très petites particules cristallines.** [B. Vonnegut's report on the utilization of thin films of supersaturated solutions for the detection, counting and identification of very small crystalline particles.] *Puy-de-Dôme, Observatoire, Bulletin*, Ser. 2, No. 3:77, July **1953. DWB**—A note mentioning difficulties experienced by the author in 1946 in using VONNEGUT's method of obtaining crystals from 2 supercooled solutions (one with a volatile and one with a non-volatile solvent). The main trouble is that crystals often form spontaneously even in the absence of foreign particles because of supersaturation. The author suggests using the method to study supersaturations as well as supercooling. Contaminated droplets may act as seeding agents. *Subject Headings:* **1. Cloud physics 2. Ice nuclei counters 3. Supersaturated droplets.**—*M.R.*

6F–239 551.574.1:551.576.1

Dessens, H., **Sur l'apparition des particules glacées dans les cumulus.** [Appearance of ice particles in cumulus.] *Puy-de-Dôme. Observatoire Bulletin*, Ser. 2, No. 1:20–23, Jan. **1953.** 4 figs., 6 refs. **MH-BH**—The author discusses the results of visual observations, aided by still life and motion picture photography, on the transformation of a cumulus cloud from a cloud of supercooled droplets into a cloud of ice crystals. The observed phenomena are interpreted in the light of Bergeron's theory. *Subject Headings:* **1. Ice crystals in clouds 2. Cumulus cloud structure 3. Ice crystal nuclei.**—*I.L.D.*

6F–240 551.571

Dufour, L. (*Brussels*), **Sur la condensation de la vapeur d'eau dans l'atmosphère.** [Atmospheric condensation of water vapor.] *I.U.G.G. Association of Meteorology, 9th, Brussels, Aug. 1951. Procès-Verbaux des Séances. Mémoires et discussion*, pub. Brussels, Dec. **1953.** p. 152. **DWB**—Brief abstract of paper presented at the meeting. *Subject Heading:* **1. Condensation of water vapor.**

6F–241 551.574.1

Dufour, Louis and Defay, Raymond, **Sur la formation des germes de condensation et de solidification autour d'un noyau solide insoluble.** [Formation of condensation nuclei and solidification around an insoluble solid nucleus.] *Tellus*, Stockholm, 5(3):293–301, Aug. **1953.** 4 figs., 2 tables, 11 refs., 41 eqs. English summary p. 293. **MH-BH**—Solid insoluble nuclei help the formation of water or ice inasmuch as the adhesion-coefficient of water or ice on the solid be positive. If this coefficient is greater than 1 and if the solid nucleus is great enough this effect may be sufficient to render null the free energy of formation of germs and to provoke the condensation or the solidification without germ. These effects can be calculated *a priori*, assuming a certain degree of saturation of the atmospheric water vapour provided the suitable adhesion-coefficient be known. (*Same item as* 5.7–137, July 1954, *MAB.*) *Subject Headings:* **1. Condensation nuclei 2. Condensation processes.**—*Authors' abstract.*

6F–242 536.421:546.212

Dumoré, J. M.; Merk, H. J., and Prins, J. A., **Heat transfer from water to ice by thermal convection.** *Nature*, London, 172(4375):460–461, Sept. 5, **1953.** fig., 3 refs., 2 eqs. **DWB**—Heat transfer was measured by shrinkage of a sphere of ice immersed in water. Observed curve showed minimum at 0°C, peak at 2.4°C, minimum due to inversion of convection current at 4.8°C, then steady rise, all in agreement with theory. *Subject Heading:* **1. Ice melting.**—*C.E.P.B.*

6F–243 551.573:551.578.11

Froessling, N. (*Stockholm*), **Contribution to a discussion about drops changing in size.** *International Union of Geodesy and Geophysics. Association of Meteorology, 9th, Brussels, Aug. 1951, Procès-Verbaux des Séances Mémoires et discussion*, pub. Brussels, Dec. **1953.** p. 137–138. Its. *AIM* No. 9/c. **DWB.** Also issued as *Uppsala. Universitet. Meteorologiska Institution, Meddelande*, No. 39. Abstracted from reprint. **DWB**—The author presents his formula for the total

rate of evaporation of a falling drop (*Gerlands Beiträge*, 52:170–216, 1938). It is

$$\frac{dm}{dt}=4\pi\Delta\frac{Mp}{RT}r(+1k\sqrt{Re}),$$

$\frac{dm}{dt}$ =evaporation in gm/sec; Δ =diffusion constant in cm²/sec; M =water weight; R =universal gas constant; T =absolute temperature; p =difference between pressure of vapor at the surface; Re =Reynolds number, k =constant characteristic for the evaporating substance. *Subject Heading:* **1. Evaporation of raindrops.**—*I.L.D.*

6F–244 551.574.1 551.508.91

†Gucker, Frank T. Jr.; Egan, James J. and Rose, Donald G., **Coagulation of aerosols.** Indiana. Univ. Dept. of Chemistry, Contract AF 19(122)-375, Scientific Report, No. 2, July 31, **1953.** Each ch. renumbered. figs., 144 refs., eqs. **MH-BH, DWB**—A thorough study of the theoretical and experimental aspects of coagulation of aerosols as applicable to atmospheric pollution and cloud physics problems. The five main chapters comprise the following: I. A summary of previous work on coagulation of aerosols based on a survey of nearly 100 published articles; II. Experiments with the improved (right-angle scattering) aerosol counter; III. A new forward-scattering aerosol-particle counter; IV. An apparatus for measuring light scattering from single aerosol particles and V. Calculations from the Mie theory. *Subject Headings:* **1. Aerosol coagulation 2. Aerosol counters 3. Scattering of light 4. Mie theory.**—*M.R.*

6F–245 551.574.1

Gunn, Ross (*Director, Physical Research, U. S. W. B., Wash., D. C.*), **A pressurized shaft for the study of artificial clouds and precipitation mechanics.** *I.U.G.G. Association of Meteorology, 9th, Brussels, Aug. 1951, Procès-Verbaux des Séances. Mémoires et discussion*, pub. Brussels, Dec. **1953.** p. 150. **DWB**—A short note on experimental research. A shaft 200×2.5×2.5 m was prepared for cooling of air by sudden expansion. Cloud production, evaporation and growth of droplets can be studied. *Subject Headings:* **1. Cloud physics 2. Cloud laboratory.**—*A.A.*

6F–246 551.574.1:551.578.41

Isono, K. (*Tokyo Univ.*), **An electron-microscope study of ice crystal formation. A preliminary report.** *Meteorological Society of Japan, Journal*, 2nd Ser., 31(9):318–322, Sept. **1953.** 5 figs., 10 refs. **MH-BH**—Report on a cloud-chamber experiment. In order to investigate the mechanism of ice crystal formation, crystals were produced by silver iodide and dry ice seeding. The crystals were then examined under a microscope in their initial stages of growth. Microphotographs of the crystals are presented. They show, among others, the AgI nucleus at the center of the ice crystals produced by AgI seeding. (*Same item as* 6.1–240, Jan. 1955, *MAB.*) *Subject Headings:* **1. Ice crystal formation 2. Artificial nucleation.**—*G.T.*

6F–247 551.578.7

Israël, H., **Neuere Anschauungen und Versuche zur Erklärung der Hagelbildung.** [New views and attempts at explanation of hail formation.] *Umschau*, 53(13):385–388, July 1, **1953.** 2 figs., 11 refs. **DWB**—Hail is associated with thunder and regional, seasonal and diurnal distribution is similar but with important differences. Structure and form of hailstones are described and related to microphysics of cloud layers. The conical shape is regarded as fundamental as in rime. The layer structure is also analogous to that of rime and attributed to changes in size of cloud droplets, or possibly by passing up and down through 0°C level. (*Same item as* 4.10–215, Oct. 1953, *MAB.*) *Subject Heading:* **1. Hail formation.**—*C.E.P.B.*

6F–248 551.578.41:551.574.1

Itoo, Kyoji, **Phenomenon of ice crystals in the air.** (**On small ice crystals. Pt. 1.**) *Papers in Meteorology and Geophysics*, Tokyo, 2(1):67–75, **1951.** 5 figs., 7 tables. Also: **Forms of ice crystals in the air.—Size, mass and some other properties of ice crystals in the air.** (**On small ice crystals. Pts. 2 and 3.**) *Ibid.*, 3(3,4):207–216, 297–306, Jan., March **1953.** 14 figs., 6 tables, 6 plates, 8 refs. **MH-BH**—Pt. I reports on observation of ice crystals at Hailar, Manchuria. Physical properties were studied by means of microphotography. Results given in tables and figures. In Pts. 2 and 3 a detailed geometrical analysis of the hexagonal twin prism, hexagonal prism, hexagonal plate and seven miscellaneous forms of ice crystals is offered in text and diagrams. Microphotographs of these crystals are appended. The equipment used (microscope, light source, film) and the method applied in obtaining the pictures are described. Pt. 3 gives further details of the microphotographic study, viz. size, thickness, mass and frequency of the different ice crystals, their space density, the sizes of enclosed air bubbles, adhesive properties, sublimation, composition,

symmetry, etc. The difference between ice crystals in the air and snow crystals is discussed and illustrated. (Pts. 2 and 3 are *same item as* 5.5-181, May 1954, *MAB.*) *Subject Headings:* **1. Ice crystals 2. Ice crystal formation 3. Microphotographs.**—*G.T.*

6F–249 551.515.42:551.577(52)

*Itoo, K.; Yano, N.; Hama, K. and Naruse, H., **An observation of raindrop in thunderstorm.** *Meteorological Society of Japan, Journal*, 2nd Ser., 31(10):336-347, Oct. **1953.** 14 figs., 2 tables, ref. In Japanese; English summary p. 336. **MH-BH**—As a result of rainfall observations during thunderstorms made simultaneously in 20 locations in Kawagoe District, Japan (Aug. 1952), data are presented on: variation in time and space of number of raindrops; amount of rain as a function of drop size and of number of drops; variation in time of precipitation intensity and precipitation area. *Subject Headings:* **1. Thunderstorm rainfall 2. Rain structure 3. Raindrop size distribution 4. Kawagoe District, Japan.**—*G.T.*

6F–250 551.576.1:551.508.93:535.242

Johnson, John C. and Eldridge, Ralph G., **Cloud studies at M.I.T.** *Mount Washington Observatory News Bulletin*, No. 22:8-9, June **1953.** **DLC**—Brief report on the field testing of an infrared transmissometer for cloud drop distribution measurement. The principal advantage of this optical method is its suitability for measuring droplets with diameters as small as two microns. *Subject Headings:* **1. Drop size measurement 2. Infrared transmissometers.**—*G.T.*

6F–251 551.574.1:551.578.41:536.421

Kachurin, L. G., **Veroiatnost' obrazovaniia ledianykh zarodysheĭ v pereokhlazhdennoĭ vode.** [The probability of ice nuclei formation in supercooled water.] *Akademiia Nauk SSSR, Doklady*, 93(2):307-310, Nov. 11, **1953.** 2 figs., 5 refs., 9 eqs. **DLC**—The probability of volumetric crystal nuclei formation in supercooled water is computed according to the equation

$$W = \exp\left[C - \frac{u}{kT} - \frac{4\pi\delta}{3kT}\cdot\left(\frac{2\delta u}{NpLLm\,\frac{T_0}{T}}\right)\right].$$

In this paper the author studies a method of determining the constants of the equation on the basis of comparing them with a large number of tests measuring temperature of freezing drops. This method can also be used for other liquids possessing a speedy linear crystallization and a high heat conductivity. (*Same item as* 6.1-241, Jan. 1955, *MAB.*) *Subject Headings:* **1. Ice nuclei formation 2. Supercooled water.**—*A.M.P.*

6F–252 551.574.1(02)

Kiriukhin, B. V. and Krasikov, P. N., **Oblaka, dozhd' i sneg.** [Clouds, rain and snow.] Leningrad, Gidrometeorologicheskoe izd-vo, **1953.** 107 p. figs., map. **DLC**—A semi-popular edition (23,000 copies issued) giving some technical information on: water supply in the atmosphere and on earth, evaporation, condensation, sublimation, frost, rime, clouds, cloud particles, cloud formation, cumulus and CuNb formation, frontal clouds, stratus, precipitation, snow crystals, snow, hail, thunder, snow cover, forecasting rain and artificial cloud modification (p. 80-99). The last named section discusses many methods which have been used in past attempts at cloud modification or rain inducement, including those at the Institute for Experimental Meteorology under V. N. Obolenskii in 1932. *Subject Headings:* **1. Cloud physics textbooks 2. Weather control 3. Textbooks. I. Obolenskii, V. N.**—*M.R.*

6F–253 551.576:536.421

Lafargue, C., **Quelques remarques concernant la microphysique des nuages surfondus et les noyaux de congelation atmosphériques.** [Remarks on microphysics of supercooled clouds and atmospheric freezing nuclei.] *Puy-de-Dôme. Observatoire, Bulletin*, Ser. 2, No. 1:12-19, Jan. **1953.** table, 15 refs., 2 eqs. **MH-BH**—The results of previous experimental investigations on the critical temperature of different sources and the relationship between freezing temperature and droplet size are summarized. The results of these studies are applied to an examination of the physical state of supercooled clouds with droplet size 8μ to 10μ, to the closed systems producing hail, to the development of cumulus congestus and to the formation of hoar frost. The phenomenon of supercooling below $-41°C$ is discussed. *Subject Headings:* **1. Supercooled clouds 2. Freezing nuclei.**—*I.L.D.*

6F–254 551.509.67:551.577.33

*Langmuir, Irving, **Analysis of the effects of periodic seeding of the atmosphere with silver iodide.** General Electric Research Laboratory, Contract DA-36-039-sc-15345, Project DA 3-90-07-022, Project SC-24-172B-0, Project Cirrus, Final Report, Pt. 2, May **1953.** 340 p. numerous tables,

iagrs., foot-refs. **DWB**—This voluminous statistical report begins with the basic discoveries of CHAEFER and LANGMUIR regarding the effects of dry ice and later of AgI seeding and cloud physics. The seeding of stratus and cumulus clouds, the widespread effects of seeding cumulus clouds and urricanes; periodic seeding of clouds in New Mexico, methods of evaluating significance of 7-day eriodicity in rainfall; periodicities in cloudiness, wind, pressure, tropopause height, temperature loft; U. S. Weather Bureau studies on 7-day periodicities and, finally, 7-day periodicities and phase ropagation over the U. S. occupy subsequent chapters. A great deal of tabular, graphical and tatistical data are presented to support controversial claims of high significance. (For Pt. I *see tem* 6F–275.) *Subject Headings:* **1. Project Cirrus 2. Cloud seeding with silver iodide 3. Tropo-ause height variations 4. Rainfall periodicities.**—*M.R.*

6F–255 551.576.11

Levin, L. M. and Starostina, R. F., **Nekotorye rezul'taty issledovaniia struktury oblakov.** Some results of the investigations on the structure of clouds.] *Akademiia Nauk SSSR, Doklady*, 93(2):253–256, Nov. 11, **1953.** 2 figs., 5 refs., 7 eqs. **DLC**—Some results of a complex investigation of the microstructure of clouds by means of collecting cloud drops with the aid of a cloud drop "trap" carried out during June–Nov. 1951 as part of the Elbrus high-mountain expedition of the Geophysical Institute of the U.S.S.R. are presented and discussed. They concern: the number of drops with diameter exceeding 4μ which varied (depending on the types of the clouds) from less than 100 to 1000 in m^3; the size of the drops; their average cubic diameter, etc. (*Same item as* 6.1–258, Jan. 1955, *MAB.*) *Subject Headings:* **1. Cloud structure 2. Cloud droplets 3. Drop size data.**—*A.M.P.*

6F–256 551.574.1

Levin, L. M., **O nasazhdenii chastits iz potoka aerozolia na prepiatstviia.** [Deposition of particles from aerosol onto an obstacle.] *Akademiia Nauk SSSR, Doklady*, 91(6):1329–1332, Aug. 21, **1953.** table, 4 refs., 16 eqs. **DLC**—In order to determine the relationship between the number of drops of given size deposited upon an obstacle and the number of drops in unit volume of a cloud it is necessary to introduce the concept of coefficient of capture. It is demonstrated theoretically that the minimum diameter of the droplets captured by an obstacle is determined by the gradient of air velocity near the anterior critical point of a given obstacle. The relationship of this critical point to the capture coefficient and its value for various types of aerosols are given in a table. (*Same item as* 5.8–192, Aug. 1954, *MAB.*) *Subject Headings:* **1. Aerosol deposition 2. Drop size distribution.**—*I.L.D.*

6F–257 551.558.1:551.576.11

†Ludlam, F. H. and Scorer, R. S., **Convection in the atmosphere.** *Royal Meteorological Society, Quarterly Journal*, 79(341):317–341, July **1953.** 2 figs., 65 refs. **DWB**—Authors aim at "a unified picture of what happens during the process of convection" and summarize much recent research. They deal first with slow convection, instability resulting in cellular patterns (compared with laboratory experiments), transverse rolls or billows and mammatus in which motion is downwards in the middle. For thermals the bubble theory with amalgamation of wakes is preferred to the chimney theory. Influence of shearing and source of warm air are considered, importance of high ground being emphasized. Types of motion are described: streets, stable rotating thermals (e.g., dust devils, waterspouts), compensating down currents vs removal of air by sonic disturbance, and the phenomena of sea breezes and the sea breeze front. The formation of Cu is studied including limitation of height of small single-bubble Cu by mixing with clear air. Large Cu are regarded as a chaotic assemblage of bubbles (turrets) and their wakes; measurements of temperature and updraft are quoted in relation to cloud-top height and maintenance of convection. Finally, authors discuss Cu formation over oceans, diurnal variation of convection and forecasting Cu. (*Same item as* 6.11–2, Nov. 1953, *MAB.*) *Subject Headings:* **1. Convection 2. Cloud formation 3. Cumulus cloud formation.**—*C.E.P.B.*

6F–258 551.574.1

McDonald, James E., **Erroneous cloud-physics applications of Raoult's law.** *Journal of Meteorology*, 10(1):68–70, Feb. **1953.** table, 13 refs., 3 eqs. **MH-BH**—Raoult's law is that when m' moles of a non-electrolyte are dissolved in m moles of water, vapor tension e' of solution is related to that of pure water e by $(e'-e)/e=-m'/(m'+m)$. For electrolytes, e.g., sea salt, this becomes $(e'-e)/e=-im'/(im'+m)$, where i is van't Hoff factor. Values of i are computed for aqueous solutions of NaCl. Resulting reduction of vapor pressure is much larger than is given by Raoult's law. W. E. HOWELL's computed growth rates of cloud drops may be 10–15% too low. (*Same item as* 4.8–168, Aug. 1953, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Raoult's law.**—*C.E.P.B.*

6F–259 551.574.1:551.578.41

†McDonald, James E., **Homogeneous nucleation of supercooled water drops.** *Journal of Meteorology*, 10(6):416–433, Dec. **1953.** 3 figs., 3 tables, 43 refs., 10 eqs. **MH-BH**—This lengthy

paper examines the theory of nucleation. Previous efforts to explain the observed rapid crystallization at −40°C are examined critically and numerous significant errors are pointed out. The theoretical nucleation rate is very sensitive to the numerical value adopted for the specific free energy of a water-ice interface, but the difficulties of estimating this are found to be very great, especially the direct calculation of the distortion energy of ice. After a crude correction for this, a theoretical temperature of −26°C is found for the spontaneous nucleation of drops of 10 micron radius. This is so much nearer the observed −40°C than are other estimates that it is considered to strengthen the belief that this transition is due to spontaneous nucleation. (*Same item as* 5.6-204, June 1954, *MAB.*) *Subject Headings:* **1. Nucleation theory 2. Supercooled water drops.**—*C.E.P.B.*

6F-260 551.574.

Magono, Choji, **Extraction from literatures on artificial production of precipitation.** *Researches on Snow and Ice*, Tokyo, No. 1:227–230, Oct. **1953.** In Japanese. **DWB**—Review of 4 papers on cloud physics: Findeisen (1938), Schaefer (1951), Coons and Gunn (1951), and a group of papers on cloud seeding. *Subject Headings:* **1. Cloud physics 2. Reviews.**—*M.R.*

6F-261 551.577.1:551.50

Magono, Choji, (*Yokohama National Univ., Yokohama*), **Volume distribution of the large precipitation elements.** *Meteorological Society of Japan, Journal*, 31(8):286–297, Aug. **1953.** 10 figs., 10 photos, 5 refs., 3 eqs. In Japanese; English summary p. 286–287. **MH-BH**—A method of obtaining photographic records by allowing various types of precipitation to fall on sensitive photographic paper is described. The relations between wetted areas and diameters of raindrops, snowflakes (dry and melting) and graupel were found by various experimental methods. Frequency curves of diameters and volumes of different types of precipitation are shown. *Subject Headings:* **1. Raindrop size distribution 2. Precipitation measurement 3. Graupel.**—*C.E.P.B.*

6F-262 551.576.11

Malkus, Joanne Starr, **Some results of a trade cumulus cloud investigation.** Woods Hole Oceanographic Institution, Contract N6onr-27702 (NR-082-021), Marine Meteorology, Technical Report, No. 23, May **1953.** 46 p. 20 figs., 9 tables, refs. p. 39–40. **DWB**—Cross sections through two trade cumulus clouds are presented, showing the temperatures, turbulence, and water vapor content of the clouds and their nearby environment, the cloud slope, and the external wind profile. The two clouds were studied over the Caribbean Sea on the same afternoon in June, 1952, and were in widely differing phases of their life cycles. The measurements were made from a slow-flying aircraft equipped with sensing instruments and whose behavior as a meteorological tool had been previously studied. Numerous calculations are made from the cross sections, including total and dynamic entrainment, drafts, slopes, and liquid water content. These are, where possible, checked against the corresponding observations. In addition to testing previously evolved theoretical models, and the usefulness of the steady-state hypothesis, the data provide some evidence concerning the formation and growth of larger trade cumulus clouds from several smaller ones and by successive stages. (*Same item as* 5.6-210, June 1954, *MAB.*) *Subject Headings:* **1. Trade wind cumulus clouds 2. Cloud formation 3. Caribbean Sea.**—*Author's abstract.*

6F-263 551.576.12:551.555.1

Malkus, Joanne Starr, **Trade-wind clouds.** *Scientific American*, 189(5):31–35, Nov. **1953.** 6 figs. **DWB**—This article contains a lucid description of current ideas regarding the mechanism of cumulus cloud development in the trade wind area, including an exposition of the new theory of entrainment which accounts for shallower development and earlier dissipation of isolated cumuli, in comparison with groups of trade cumuli (which frequently merge and develop to great heights). Numerous flights through trade wind clouds were made in the West Indies, and the resulting models and cross sections considerably revise the simpler but less realistic models of a few years ago. (*Same item as* 5.6-211, June 1954, *MAB.*) *Subject Headings:* **1. Trade wind cumulus clouds 2. Entrainment 3. Cloud circulation models 4. West Indies.**—*M.R.*

6F-264 551.574.1:551.578.41

Mason, Basil John, **The growth of ice crystals in a supercooled water cloud.** *Royal Meteorological Society, Quarterly Journal*, 79(339):104–111, Jan. **1953.** 7 figs., 3 tables, 4 refs., 17 eqs. **DWB**—Theoretical expressions are derived for growth rate of simple ice crystals at rest in a supercooled water cloud at temperatures 0 to −40°C, and compared with measured values in cold chambers. Photographs show crystal habits at different temperatures. The effect of fall of the crystal is examined, and a criterion found for transition from polyhedral to dendritic growth occurring when crystal radius exceeds 100μ. (*Same item as* 4.6–164, June 1953, *MAB.*) *Subject Headings:* **1. Snow crystal formation 2. Ice crystal growth.**—*C.E.P.B.*

6F–265 551.578.41:551.574.1

Mason, Basil John, **Künstliche Schneekristalle dienen der Erforschung atmosphärischer Vorgänge.** [Artificial snow crystals aid the investigation of atmospheric processes.] *Umschau*, 3(1):15–17, Jan. 1, 1953. 12 figs., table, 3 refs. **DLC**—This interesting article describes laboratory experiments in which snow crystals were formed under conditions resembling nature. Crystals formed with or without nuclei of AgI or dry ice in a cloud of small water drops at 0° to −40°C were collected on glass slides and covered with transparent plastic. Crystal forms are tabulated according to temperature. Growth was also microfilmed on polished metal plates cooled to different temperatures or on glass slides. The articles is illustrated by excellent microphotographs with scales. (*Same item as* 4.7–161, July 1953, *MAB.*) *Subject Headings:* **1. Snow crystal formations 2. Artificial snow crystals 3. Snow crystal forms.**—*C.E.P.B.*

6F–266 551.509.67:551.574.1:551.577.11

Mason, B. J., **The natural and artificial production of rain.** *Royal College of Science, Scientific Journal*, Vol. 22, **1953.** 14 p. 5 figs. Abstracted from reprint. **DWB**—General lecture on processes of cloud formation, mechanisms of precipitation release (coalescence, ice crystal). Precipitation mechanisms are shown in diagram form. Techniques of rain making are set out, and it is concluded that it is often possible to release some precipitation from suitable clouds by seeding, causing local changes in distribution but not in the general level of rainfall. (*Same item as* 5.4–72, April 1954, *MAB.*) *Subject Headings:* **1. Cloud seeding 2. Precipitation formation.**—*C.E.P.B.*

6F–267 551.586.11:551.574.1

Mason, B. J., **Progress in cloud physics research. A progress report on recent investigations at Imperial College, London.** *Archiv für Meteorologie, Geophysik and Bioklimatologie, Ser. B*, 5(1):1–52, **1953.** 26 figs., 6 tables, 52 refs., 16 eqs. English, German and French summaries p. 1–2. **MH-BH**—This valuable report collects 4 years of research on the physical processes in clouds which culminate in release of precipitation. It deals first with spontaneous nucleation by collision of vapor molecules. Measurements of condensation nuclei over the N. Atlantic are tabulated according to cloud types, large salt nuclei and their contribution to opacity, and origin of nuclei. Sec. 4 covers nucleation of supercooled water, initiation of ice phase, and freezing of supercooled drops. The expansion chamber experiments of FINDEISEN and SCHULZ are reexamined; freezing temperatures of solutions of electrolytes and chemical seeding of supercooled clouds are discussed. Sec. 5 deals with theory and observation of growth of ice crystals in clouds or on solid surfaces, Sec. 6 with precipitation mechanism in stratified clouds and Sec. 7 with production of showers by coalescence, ice particles or wet hailstones. In Sec. 8 experimental studies of precipitation by radar and drop spectrograph are described. Finally, author considers macroscopic features of ice clouds and orographic cirrus. (*Same item as* 5.2–5, Feb. 1954, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Droplet coagulation 3. Condensation nuclei.**—*C.E.P.B.*

6F–268 551.574.1:551.571

Nolan, P. J. and MacCormaic, P. S. (*both University College, Dublin*), **Nuclei produced by disruptive discharge at a water surface.** *Dublin Institute for Advanced Studies. School of Cosmic Physics, Geophysical Bulletin*, No. 7, July **1953.** 19 p. 6 figs., 14 refs. **DWB**—Extremely small condensation nuclei are produced by electric discharge at a water surface. The nuclei are uncharged and consequently can play no part in the drop charging process of WILSON's theory of thunderstorms The failure of previous observers to detect the discharge nuclei is ascribed to the low effective expansion ratio of the Aitken counter. By measuring the size and the supersaturation required for condensation on discharge nuclei it is shown that there is a vapor pressure deficit of between 10% and 15%. Similar measurements indicate that in the case of atmospheric condensation nuclei the vapor pressure deficit is about 5%. The Wilson ion and cloud expansion ratios are determined by means of the photo-electric nuclei counter. The results show that the expansion of the counter is truly adiabatic. *Subject Headings:* **1. Condensation nuclei 2. Saturation deficit 3. Nuclei counters.**—*Authors' abstract.*

6F–269 551.576:535.243

Parasol, Matthew (*Inst. for Atomic Res., Iowa St. Coll.*), **A method for the determination of the compositions and temperatures of stratospheric clouds.** *Journal of Geophysical Research*, 58(2):279, June **1953.** 7 refs. **DWB**—The physical state and temperature of noctilucent clouds (60–90 km) and nacreous or mother-of-pearl clouds (20–30 km) could be determined by obtaining infrared spectrum in the 2–7μ region from an airplane or at a high altitude station, since liquid water at −19°C has a strong infrared absorption band at 2.95μ and a weaker band at ~6.1μ and ice at 0°C has a band at 3.0μ and at −180°C, 3.22μ. Photographic (rocket or balloon) spectra cannot be used. CO_2 and O_3 interference can be neglected as they have no overlapping bands in the critical region. The temperature of the ice clouds can be determined from the O-H stretching frequency in the

infrared. (*Same item as* 5.11–150, Nov. 1954, *MAB.*) *Subject Headings:* **1. Stratospheric cloud 2. Spectrophotometry.**—*M.R.*

6F–270 551.574.

†Pound, G. M.; Madonna, L. A. and Isaacs, R. M., **Kinetics of nucleation in atmospheric phas transitions.** Carnegie Institute of Technology, Metals Research Laboratory, Contract AF 19(122) 185, Final Report, Dec. 31, 1953. 11 p. 24 refs. **MH-BH**—The basic material in 4 scientifi reports on nucleation in cloud chambers are summarized in this final report of the project and list of 6 publications in scientific journals, and 24 other references on the subject attached. Th papers are (1) on critical supercooling of pure water droplets, (2) low temperature cloud chambe studies on water vapor, (3) on tertiary butyl alcohol vapor and (4) some observation on hetero geneous condensation of metal crystals from the vapor phase. *Subject Headings:* **1. Nucleatio processes 2. Supercooled water 3. Cloud chambers.**—*M.R.*

6F–271 551.574.1:551.508.9

Pound, G. M.; Madonna, L. A. and Sciulli, C. M., **Low temperature cloud chamber studie on water vapor.** Carnegie Institute of Technology. Metals Research Laboratory, Contract AF 19(122)-185, Scientific Report, No. 2, Jan. 1, **1953.** 23 p. 11 figs., table, 38 refs. **MH-BH**— The critical supersaturation for the precipitation of water droplets or ice crystals from the vapo was measured between 0°C and −75°C by an expansion chamber technique. Nitrogen was used as the carrier gas, and measurements were made both in the presence and in the absence of an electric field. Existing critical supersaturation data for nucleation of water droplets from the vapor in the presence of an electric field probably represent heterogeneous nucleation. Comparison of the data taken in the absence of ions with the Becker-Döring equation shows fair agreement at the higher temperatures but marked deviation at lower temperatures. The temperature dependence indicates that agreement with the Becker-Döring equation at the higher temperatures may be fortuitous. At terminal temperatures below −65°C, the presence of gaseous ions appeared to have no effect on the critical supersaturation. Also, the precipitate particles appeared to be spherical above −65°C, while at lower temperatures precipitation was in the form of ideomorphic ice crystals. These results are in general agreement with the work of SANDER and DAMKÖHLER. However, the present data give additional evidence in support of direct nucleation of ice from the vapor phase below −65°C. *Subject Headings:* **1. Condensation 2. Cloud chambers.**—*Authors' abstract.*

6F–272 551.574.1

Rau, Walter, **Über den Einfluss des Tropfenvolumens auf die Unterkühlbarkeit von Wasser tropfen und die Bedeutung des Gefrierkernspektrums.** [On the influence of drop volume on the supercooling of water drops and the importance of the freezing nucleus spectrum.] *Zeitschrift für Naturforschung*, 8a(2/3):197–204, Feb./March **1953.** 6 figs., 14 refs. **DLC**—Observations on water drops cooled on polished chromium showed that J. R. HEVERLEY's functional relation between freezing point and drop size does not apply to very small drops. The relatively greater supercooling of small drops is due only to the smaller chance that they contain nuclei causing freezing at higher temperatures. The peaks of the freezing spectrum at −4, −10 to −12 and −20°F are independent of drop size, but crystallisation in the −20° group increases in frequency with decreasing drop size because nuclei effecting crystallization at −10 to −12° are rarely absent from large drops and this masks the effect of the −20° nuclei. Eleven frequency curves of freezing temperatures are given for drops ranging from 0.015 to 600 mm³ volume. (*Same item as* 4.8–172, Aug. 1953, *MAB.*) *Subject Headings:* **1. Freezing nuclei 2. Supercooling of drops.**—*C.E.P.B.*

6F–273 551.574.1:551.515.42:551.577

Reynolds, S. E. (*N. Mexico Inst. of Mining & Technology, Socorro, N. M.*), **Thunderstorm precipitation growth and electrical-charge generation.** *American Meteorological Society, Bulletin* 34(3):117–123, March **1953.** 5 figs., table, 19 refs. **DWB**—Data obtained by WORKMAN and the author in New Mexico indicate that precipitation can be initiated in thunderstorms in the area, and also in the Ohio Valley (BYERS' data) without involving the ice-crystal stage, and that this process can be explained by LANGMUIR's cloud-droplet growth theory. Charts show: 1) vertical speeds prior to lightning; 2) particle size vs. temperature and liquid water content required for growth by glaze accretion; 3) and 4) time and temperature vs. liquid water content required to produce wet hailstones at a given updraft velocity, respectively, etc. It is concluded that vertical motion of radar echo does not represent the speed at which cloud or precipitation elements move upward, but the speed that the conditions favorable for glaze ice production move upward. (*Same item as* 5.2–192, Feb 1954, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Thunderstorm rainfall 3. Vertical velocities in clouds.**—*M.R.*

6F–274 551.574.1

Roulleau, Jean (*Établ. d'Études et de Recherches Mét.*), **Conceptions actuelles du mécanisme e la pluie.** [Contemporary concepts on the mechanics of rainfall.] *L'Astronomie*, Paris, 67:213–22, June **1953.** 6 figs. **DWB**—This semi-popular treatment gives cross section for upsliding and onvective motion cases and discusses Bergeron's theory of the origin of precipitation, the application f radar and the artificial stimulation of rainfall. (*Same item as* 5.8–195, Aug. 1954, *MAB.*) *Subject Headings:* **1. Precipitation formation 2. Bergeron's theory.**—*A.A.*

6F–275 551.574.1

†Schaefer, Vincent J., **Laboratory, field, and flight experiments.** General Electric Research aboratory, Contract DA-36-039-sc-15345, Project DA-3-90-07-022, Sc Project 24–172B-0, Project Cirrus, Final Report, Pt. 1, March **1953.** 170 p. 4 tables, figs., 75 refs. **DWB**—Project Cirrus ontinued from Feb. 28, 1947 to Sept. 30, 1952 under Office of Naval Research and U. S. Army ignal Corps contract. The principal scientists were Irving Langmuir, Vincent J. Schaefer nd Bernard Vonnegut. Numerous reports and scientific articles have been issued, but this omprehensive illustrated report summarizes them all and gives details of the history of the research going back to General Electric studies on gas masks and chemical fogs in 1940–42) and icing studies n Mt. Washington in 1953. The first cold chamber experiment was made in July 1946 and the irst cloud seeding on Nov. 13, 1946. Details of laboratory field and flight experiments are treated n a systematic manner. (For Pt. II *see item* 6F–254.) *Subject Headings:* **1. Project Cirrus 2. Cloud eeding research 3. History of cloud seeding 4. Cloud physics.**—*M.R.*

6F–276 551.558.1

Scorer, R. S. and Ludlam, Frank Henry, **Bubble theory of penetrative convection.** *Royal Meteorological Society, Quarterly Journal*, 79(339):94–103, Jan. **1953.** 6 figs., 10 refs., 5 eqs. **DWB**—Penetrative convection in which air rises through a large environment is studied as an intermittent et rising as bubbles from a localized source. A bubble sheds its outer skin into a disturbed wake ntil it disappears; in the wake the ascent of further bubbles is facilitated. Above the bubble the ir is lifted and cooled and drains down outside. Bubble structure is illustrated by photographs f Cu. The limiting velocity of a cumulus tower is calculated from its buoyancy and agrees with bservation. Transport of heat upwards occurs mainly by aggregation of small bubbles into large. *Subject Headings:* **1. Bubble theory 2. Entrainment.**—*C.E.P.B.*

6F–277 551.574.1

Shishkin, N. S., **Nekotorye fizicheskie zakonomernosti fazovykh prevrashchenii gidrometeorov.** Some physical regularities of the phase transformation of hydrometeors.] *Akademiia Nauk SSSR, zvestiia, Ser. Geofiz.*, No. 1:78–82, **1953.** 4 refs., 8 eqs. **DLC**—Critical conditions of atmospheric emperature and relative humidity determining the phase transformation of water into ice particles nd the thawing of the latter were obtained. The value of the threshold of thawing of the particles nd the threshold of freezing of water drops was determined for absolutely dry air. (*Same item as* .4–177, April 1954, *MAB.*) *Subject Heading:* **1. Cloud physics.**—*I.L.D.*

6F–278 551.578.11

Shishkin, N. S., **O razmere kapel' dozhdia.** [The size of rain drops.] *Akademiia Nauk SSSR, Doklady*, 90(2):171–174, May 11, **1953.** 4 figs., 5 refs., 6 eqs. **DLC**—Discusses theoretical dependence of raindrop sizes on the velocity of ascending currents in clouds consisting of water droplets, ssuming the rate of growth is determined by condensation and gravitational coagulation. Graphical olution presented. Evaporation of droplet and growth of frozen particles is not discussed. Contrary to Bergeron and Findeisen, the author assumes that ice particles are not necessary for the nitiation of rain. (*Same item as* 5.4–195, April 1954, *MAB.*) *Subject Headings:* **1. Raindrop sizes . Cloud physics 3. Raindrop growth.**—*A.A.*

6F–279 551.574.1:551.508.91

Soulage, Guy, **Une cuve frigorifique pour l'étude des cristaux de glace induits artificiellement ans un nuage surfondu.** [Cold chamber for the study of ice crystals artificially induced in a supercooled cloud.] *Puy-de-Dôme. Observatoire, Bulletin*, Ser. 2, No. 4:81–90, Oct. **1953.** 3 figs., 8 refs. **DWB**—A cold chamber is described and illustrated, in which the cooling power is supplied by a melting eutectic (low melting point) mixture. This technique permits exact temperature control. An experiment is described in detail, involving use of the apparatus for counting ice-forming nuclei roduced by an AgI smoke generator. *Subject Headings:* **1. Cloud chambers 2. Nuclei count.**—*E.T.*

6F 280 551.578.7

Weickmann, Helmut, **Enstehung und Bekämpfung des Hagels.** [Origin and prevention of hail.] *Meteorologische Rundschau*, 6(9/10):175–180, Sept./Oct., **1953.** 4 figs., 2 tables, 20 refs. **DLC**—From an analysis of the physical structure of a CuNb it is calculated that a hailstone growing from 1–10 mm diameter must pass through 2700 m cloud of water content 7.5 g/m³, taking about 7 min. To grow to 30 mm it must pass through 11,700 m cloud in 19 min or proportionately less for higher water content. A necessary condition is an upward current of at least 9 m/s throughout the cloud. Such extreme conditions cannot be effectively influenced by artificial means. (*Same item as* 5.7 163, July 1954, *MAB.*) *Subject Headings:* **1. Hail formation 2. Hail suppression.**—*C.E.P.B.*

6F 281 551.574.1

*†Weickmann, Helmut, **Observational data on the formation of precipitation in cumulonimbus clouds.** (In: **Thunderstorm electricity.** Chic., Univ. of Chicago Press, **1953.** p. 66 138. 44 figs., 8 tables, refs. p. 132–138.) **DWB**—A theory that ice formation proceeds by the formation of ice crystals from supercooled water and that crystal structures are effective freezing nuclei is presented. The mechanism for the growth of ice crystals as water vapor condenses upon them is illustrated with the use of sheet mica and silver iodide crystals. The author also summarizes: investigation on frequency of natural freezing nuclei under laboratory and outdoor conditions, the relationship between ice crystal frequency and temperature and between temperature and crystallization, the shape and growth of ice crystals and the temperature interval 0° to −40°C, the shape of crystals in cumulonimbus clouds, the formation of hailstones and the formation of precipitation. Photographs of various types of ice crystals are included. (For earlier edition *see item* 4.1–167, Jan. 1953, *MAB.*) *Subject Headings:* **1. Ice crystal formation 2. Freezing nuclei 3. Hail formation 4. Cumulonimbus clouds.**—*I.L.D.*

6F–282 551.574.1:551.576.11

Weickmann, H. K. and aufm Kampe, H. J., **Physical properties of cumulus clouds.** *Journal of Meteorology*, 10(3):204–211, June **1953.** 10 figs., table, 7 refs. **MH-BH**—The technique of collecting cloud droplets in castor oil on slides is described. Slides were exposed at different heights above cloud base in New Jersey and Florida, and immediately microphotographed; records of visibility in the cloud were also made. Average droplet radius spectra and visibility curves are given for different levels in fair weather Cu (narrow spectrum), cumulus congestus and CuNb (both very broad with radius up to 100μ). The droplet concentration decreases with height above base; visibility is least 2000 m above base. The mechanism of coalescence is discussed. (*Same item as* 4.11 206, Nov. 1953, *MAB.*) *Subject Headings:* **1. Cloud physics research 2. Cumulus clouds.**—*C.E.P.B.*

6F–283 551.594

Wormell, Thomas Wilson, **Atmospheric electricity; some recent trends and problems.** *Royal Meteorological Society, Quarterly Journal*, 79(339):3–38, Jan. **1953.** 4 figs., 6 tables, 91 refs., 8 eqs. **DWB**—This comprehensive survey opens with a summary of the vertical electric field and downward current in the atmosphere in fine weather and theories of their variations. It studies the electric fields and field changes produced at the earth's surface by thunderstorms and lightning, the electrical structure of a CuNb cloud, vertical currents due to thunderclouds and the balance sheet of the earth's charge. The generation of charges in a thundercloud is discussed in detail, including evolution of the cloud, location of charge separation, theories of the processes and their quantitative evaluation, electrification by breaking of water drops and friction of ice crystals, and significant effects of co-existence of water and ice, especially of riming associated with formation of hail or graupel. Charge on rain in strong electric fields is discussed. Finally, the present state of knowledge is assessed, the main problem now being the source of thunderstorm electrification. (*Same item as* 4.7–217, July 1953, *MAB.*) *Subject Headings:* **1. Atmospheric electricity 2. Lightning 3. Electrical charges on drops.**—*C.E.P.B.*

6F–284 551.574.1:551.578.41

Yoshida, Zyungo and Kozima, Kenzi, **Change in shape of snow crystals, Pt. 1.** *Low Temperature Science, Sapporo, Japan*, 5:75–83, **1950.** 7 figs., 4 refs. In Japanese; English summary p. 83. Kozima, Kenzi, **Pts. 2 and 3.** *Ibid.*, 9:187–214, **1953.** 3 figs., 11 plates, 2 refs. English summaries p. 193–194; 208–209. **DWB**—Snow crystals were observed under microscope as they changed shape in an atmosphere saturated with water vapor at temperatures below 0°C. Photographs showing such changes are presented. Various observations lead to the belief that changes in the shape of snow crystals are always caused by evaporation or condensation of water vapor. (For separate abstracts on Pt. 1 and Pts. 2, *see items* 5.5 182 and 6.4 259, May 1954 and April 1955, *MAB.*) *Subject Headings:* **1. Snow crystal growth 2. Snow crystal structure 3. Ice crystals.**—*G.T.*

1954

6F–285 551.574.1:016

†American Geophysical Union. Committee on Cloud Physics, **Report of the Committee, 1951–1953,** H. Weickmann, chairman. *American Geophysical Union, Transactions,* 35(4):637–644, Aug. **1954. MH-BH**—Progress in cloud physics from 1951–53 is reviewed under the following general subject headings: (B) Nuclei, (C) Formation and properties of cloud particles, (D) Formation and properties of clouds, (E), Natural precipitation, (F) Artificial precipitation and cloud modification, (G) Thunderstorms, tornadoes, hailstorm and thunderstorm electricity. The many references cited in this report are given in detail in *Meteorological Abstracts,* v. 5, No. 7, p. 856–864, including, additionally, a section (A) On general works. (*Same item as* 6.1–12, Jan. 1955, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Cloud physics bibliographies. I. Weickmann, H.**—*M. R.*

6F–286 551.578.11

Bartnoff, Shepard, **Drop-size distribution and visibility in clouds and rain.** Tufts College. Dept. of Physics, Contract AF 19(604)-550, Scientific Report, No. 1, May 15, **1954.** 24 p. 2 figs., 5 tables, 9 refs., 6 eqs. **MH-BH**—The analysis of two sets of drop size distributions in natural clouds and one set of drop size distributions in rain indicates that the coefficient C in Trabert's visibility equations, $V = (Cp\bar{r})/w$, is a function of the breadth of the distribution. In this equation, r is linear mean radius, p density, and w liquid water content. As pointed out by Atlas and Bartnoff, a more useful equation is found to be $V = (Kpd_0)/w$, where d_0 is the median volume diameter. The usefulness of the Atlas and Bartnoff equation is supported by the present analysis, which verifies that the coefficient K is nearly independent of the breadth of the drop size distribution and which indicates that the value $K = 1.2$, found by Atlas and Bartnoff for natural clouds, also holds for rain. A comparison between the values of the parameters of the drop size distributions for clouds and for rain indicates that the rain distributions have a greater spread. The method used by Atlas and Bartnoff to compute C and K from the radar reflectivity and a set of theoretical distribution curves is shown to be doubtful, although the present paper verifies the correctness of their results. (*Same item as* 6.2–270, Feb. 1955, *MAB.*) *Subject Headings:* **1. Drop size distribution 2. Visibility.**—*Author's abstract.*

6F–287 551.574.1

Best, A. C., **Dimensionless equations for the growth of a drop of salt solution.** *Royal Meteorological Society, Quarterly Journal,* 89(343):89–93, Jan. **1954.** fig., 2 tables, 2 refs., 14 eqs. **DWB**—Equation for transfer of heat and water vapor to and from a drop of salt solution in the atmosphere is laborious to solve. Values of parameters are calculated as functions of temperature and an approximate equation is found relating ambient supersaturation to drop radius. This is integrated graphically and a table is given by which the rate of growth of a droplet can be calculated. (*Same item as* 5.9–215, Sept. 1954, *MAB.*) *Subject Headings:* **1. Saline nuclei 2. Drop growth theory.**—*C.E.P.B.*

6F–288 551.574.1

Birstein, S. J., **Adsorption studies of heterogeneous phase transitions.** *U. S. Air Force. Cambridge Research Center, Geophysical Research Papers,* No. 32, Dec. **1954.** 37 p. 27 figs., 21 refs. **DWB**—In an attempt to find the relation between surface structure and ability to nucleate a supercooled water cloud, studies were made on the adsorption of water vapor on silver iodide and lead iodide over a wide temperature range. Studies were also carried out on the effect of changing the surfaces of these solids, and on the adsorption isotherms and nucleating effectiveness of these altered materials. Various preadsorbed "poisons" and photolysis were used to change the solid surfaces. We found that nucleating effectiveness is dependent on a surface that has the ability to orient adsorbed water layers in an ice-like structure. As the solid surface is altered, its ability to orient these water layers is diminished and the adsorption isotherm is radically altered. As multilayer adsorption is diminished, the compound's nucleating effectiveness is also diminished. From these studies, one reaches the conclusion that nucleation by insoluble solids is essentially a surface reaction and extremely sensitive to the state of the solid surface. Because nucleation depends on the ability to orient water vapor into ice-like layers, it can be shown that it is unnecessary to go through water saturation in order to form ice crystals on solid nuclei. *Subject Headings:* **1. Adsorption of water vapor 2. Nucleation of ice.**—*Author's abstract.*

6F–289 551.574.1

Bissonnette, F., **A study of the production of monodispersed NaCl nuclei.** (In: Montreal. Univ. Dept. of Chemistry, **Use of a diffusion cloud chamber to characterize condensation nuclei.** Contract AF 19(122)-380, Final Report, May 31, **1954.** p. 16–20.) **MH-BH**—NaCl nuclei produced by the hot wire method were studied in the hope that a monodispersed solid aerosol could be produced. The influence of each variable on particle formation was carefully investigated. For

this purpose, the aerosols produced were analyzed using the electron microscope. Photographs were taken of the particles and a statistical analysis was made of their size distribution. The results obtained enable us to produce particles of known size and known monodispersity. *Subject Headings:* **1. Saline nuclei 2. Monodispersed nuclei.**—*Author's abstract.*

6F–290 551.578.41:551.524

Bossolasco, M., **Schneefall und Lufttemperatur.** [Snowfall and air temperature.] *Experientia*, 10(9):365–366, Sept. 15, **1954.** fig., 3 refs. English summary p. 366. **DWB**—Observations on Säntis (2500 m) confirm earlier results on Weissfluhjoch that the peak frequency of snowfall is at a temperature of −11°C. Frequency falls off rapidly below that temperature, but slowly above it up to −4°C. (*Same item as* 6.2–272, Feb. 1955, *MAB.*) *Subject Headings:* **1. Snow temperatures 2. Snowfall formation.**—*C.E.P.B.*

6F–291 551.501.81:551.574.1:551.576.11

†Browne, I. C.; Palmer, H. P. and Wormell, T. W., **The physics of rainclouds.** *Royal Meteorological Society, Quarterly Journal*, 80(345):291–327, July **1954.** 10 figs., 135 refs., eqs. **DWB**—This authoritative review opens with a statement of the problems and a summary of observations of temperature of cloud summits, radar data, results of cloud seeding experiments and rain from non-freezing clouds. Authors then turn to physical properties of precipitation elements, including terminal velocities of raindrops and hailstones, collection efficiencies of falling raindrops, coalescence, fragmentation of drops and splintering of ice crystals. The nature and concentration of condensation and freezing nuclei are discussed, leading to theory and observation of processes of condensation, evaporation and sublimation. Sec. 4 deals with the depth, extent, updraft, turbulence, humidity, liquid water content and droplet size, first of layer clouds and then of convective rainclouds and cumulonimbus cells. Sec. 5 discusses cloud budgets and formulates models of a cloud in a steady state and a convective raincloud, including initiation and growth of precipitation elements. Sec. 6 goes into the physics and results of radar cloud studies, with a schematic diagram of echo intensity from various levels. The review ends with a list of four unsolved problems, a comprehensive list of references, and a collection of useful constants. (*Same item as* 5.11–26, Nov. 1954, *MAB.*) (For comment by C. H. B. Priestley *see item* 6.5–220, May 1955, *MAB.*) *Subject Heading:* **1. Cloud physics.**—*C.E.P.B.*

6F–292 551.574.1

Cauer, H. (*Chem. Climatology Inst., Hohenberg/Eger*), **Physiko-chemische Vorgänge bei der Kondensation von Wasserdampf in der freien Atmosphäre.** [Physico-chemical processes involved in the condensation of water vapor in the free atmosphere.] *Geofisica Pura e Applicata*, 28:199–207, **1954.** 4 figs., 17 refs. German and English summaries p. 199. **MH-BH**—Results of a study of these processes carried out by the author in the Carpathian Mountains, on Zugspitze, Nebelhorn and Pic du Midi in the Pyrenees are presented. They show that condensation cannot take place in the free atmosphere and at finite temperatures solely by the elastic encounter of water vapor molecules. On the basis of present day information, the presence of intermolecular forces acting as factors determining the formation and growth of condensation nuclei must be recognized. These nuclei are subdivided into 3 categories: permanent, initial and mixed nuclei. This division is based on the physical and chemical nature of substances composing the nuclei or on their stability. Mixed nuclei originate from the coagulation of units of the two other categories. Initial nuclei supply the new composition with the greatest part of the water. As mixed nuclei prevail—it is seldom possible in practice to determine initial nuclei by optical means or conimeters—this must be done by chemical comparative studies. Although the chemical substance of nuclei in high mountains is the same as in plains, a quantitative divergence of the components occurs with increasing altitude. Thus, the aerosol in high mountains is not the rarefied aerosol of plains, but a mixture of nuclei with different chemical compositions. *Subject Headings:* **1. Condensation processes 2. Condensation nuclei.**—*A.M.P.*

6F–293 551.578.7

Crispin, P. R., **Hail from clear sky.** *Meteorological Magazine*, London, 83(990):377–378, Dec. **1954. DWB**—Aircraft flying at 32,000 ft in clear air above Cu and thick Ci over East Anglia Sept. 5, 1954, met medium sized hail. No condensation trails. (*Same item as* 6.5–244, May 1955, *MAB.*) *Subject Heading:* **1. Hail.**—*C.E.P.B.*

6F–294 551.510.42:551.590.25:551.577

Davis, Saville R., **What makes it rain?** *Reader's Digest*, May **1954.** p. 141–142. **DWB**—A brief popular account of the novel theory of E. G. Bowen (*see* 6F–232) regarding effect of meteoric dust showers on rainfall 30 days afterwards. It is concluded that (if further studies support the theory) rainfall all over the earth should be heavier on certain days of the year which follow (by

30 days) the periodic meteor showers. Of course, cloud conditions must be favorable or else the settling dust would not "trigger" any rain in a given area. *Subject Headings:* **1. Meteoric dust effects on rainfall 2. Cloud seeding by meteoric dust 3. Rainfall singularities.**—*M.R.*

6F–295 551.574.1

†Dessens, H., (*Puy-de-Dôme Observatoire*), **Noyaux de condensation et pluie artificielle.** [Condensation nuclei and artificial rainfall.] *Puy-de-Dôme. Observatoire, Bulletin*, n.s., No. 4:113–120, Oct.–Dec. **1954.** 2 figs., refs. p. 119–120. **DWB**—In this paper the author reviews three recent publications and his own findings on these subjects as a summary of progress in the past 7 years (to 1954) on the relation of condensation nuclei to artificial precipitation. The first, on natural condensation nuclei (Moore and Mason, 1954), distinguishes between two types of marine air mass nuclei concentration: 1) large nuclei, when wind is strong over the sea and 2) small nuclei when wind is <7 m/s, giving a distribution similar to continental air masses. Also 2 methods of formation of nuclei: A) condensation of vapor or chemical reaction (say NH_3HCl), industrial protection, fires, etc. and B) by dislocation of matter by wind, etc. This leads to large nuclei ($r > 0.5\mu$), and process A to smaller ($<0.5\mu$) nuclei. The electron microscope permits identification down to 0.2μ but not lower; optical methods, chemical analysis, etc. could be used for further detection of nuclei trajectories across the Atlantic shown on map illustrate time (3–4 days) air arriving in France has spent over Atlantic to explain differences between continental and massive concentration. Fragmentation operates when repeated desiccations occur (as in continental air masses) but this process, according to Pacaud (1949), is rare. Kinosita (1954) is next reviewed. He has studied rate of growth of various size particles in a cloud chamber. Finally, Ogiwara and Kobayashi (1954) are reviewed on growth of hygroscopic NaCl nuclei in convective clouds by coalescence or by condensation. The critical size is said to be $r = 23\mu$ or possibly in case of denser nuclei (10^{-9} g, 1 g/m^3) $r = 36\mu$. Finally, they conclude that seeding convective clouds with 1 to 10 nuclei per litre of 10^{-9} g should lead to rain formation. *Subject Headings:* **1. Condensation nuclei 2. Artificial precipitation 3. Cloud physics 4. Drop size distribution.**—*M.R.*

6F–296 551.574.1

Dorsch, Robert G. and Brun, Rinaldo, J., **Variation of local liquid-water concentration about an ellipsoid of fineness ratio 5 moving in a droplet field.** *U. S. NACA, Technical Note*, 3153, July **1954.** 68 p. 10 figs., 2 tables, 15 refs., 11 eqs. **DLC**—Analyses of calculated water-droplet trajectories show that the concentration of liquid water at various points about an ellipsoid of revolution moving through a droplet field varies considerably. Curves of local concentration factor as a function of spatial position are presented in terms of dimensionless parameters. *Subject Headings:* **1. Cloud droplet distribution 2. Air-borne water collectors.**—*NACA abstract.*

6F–297 551.574.1

Douglas, R. H. and Marshall, J. S., **The convection associated with the release of latent heat of sublimation.** McGill Univ. Macdonald Physics Laboratory, Contract AF 19(122)-217, Scientific Report, MW-19, Dec. **1954.** 31 p. 11 figs., 10 refs., 10 eqs. **DWB**—Growing ice crystals impart latent heat of sublimation to the air through which they fall and from which they draw their water substance. In air initially containing water vapor at water equilibrium, though free of water cloud, appreciable isobaric heating (up to 0.8°C at 300 mb, −15°C) is possible. The presence of water cloud contributes extra heat but the contribution is, in general, small. Such temperature increases, accompanied by adiabatic ascent of the parcel to hydrostatic equilibrium, may result in vertical development of several hundred feet in an isothermal environment; in less stable air, vertical development may be of the order of several thousand feet, comparable to the observed depths of snow-generating cells (Gunn et al., 1954). Rates of heat release, based upon Houghton's (1950) work, have been computed, and applied to a simple model to determine the consequent vertical velocity of the parcel; it is found that substantial updrafts (in excess of the terminal velocities of crystals) are possible. Furthermore, presence of water cloud reduces the updraft by reducing the rate of heat release. At a cloud edge, in a region where ice crystals are growing, gradients of vertical velocity may be expected, and hence turbulence; such boundaries would appear to favor the aggregation of crystals. It is suggested that such boundary regions provide the basis of snow-generating cells, as observed by radar. *Subject Headings:* **1. Sublimation of ice crystals 2. Convective cells 3. Cloud physics.**—*Authors' abstract.*

6F–298 551.574.1:551.577.11:551.551

East, T. W. R. and Marshall, J. S., **Turbulence in clouds as a factor in precipitation.** *Royal Meteorological Society, Quarterly Journal*, 80(343):26–47, Jan. **1954.** 10 figs., 3 tables, 34 refs., 36 eqs. **DWB**—Origin and rapid development over a wide height range of raindrops in a Cu cloud often below 0°C level cannot be due to settling under gravity, as Langmuir (1948) showed this to be too slow for droplets of radius <20 microns. The effect of coalescence due to turbulence as-

sociated with updraft is discussed, and it is shown that collisions due to local turbulence of sufficient violence (equivalent to doubling gravity field) may initiate growth of droplets in a young Cu, causing change to heavy Cu and initiating a shower. Above 20 microns growth would continue without turbulence. Further data are required. (*Same item as* 5.8–190, Aug. 1954, *MAB.*) *Subject Headings:* **1. Rain from nonfreezing clouds 2. Rain formation**—*C.E.P.B.*

6F–299 551.574.1

Frisch, H. L., **The diffusion-controlled growth of an aerosol in a turbulent medium.** *Journal of Meteorology*, 11(4):270–275, Aug. **1954.** 9 refs., 41 eqs. **DWB**—Equations of transfer of diffusing material from supersaturated turbulent fluid through a stagnant film on an aerosol nucleus lead to an expression for growth rate involving (radius)$^{3/2}$. With many competing aerosol particles the growth rate is less rapid and approaches asymptotically to a critical size. (*Same item as* 6.1–238, Jan. 1955, *MAB.*) *Subject Heading:* **1. Aerosols.**—*C.E.P.B.*

6F–300 551.574.1:551.576.1

Fritz, Sigmund; Neiburger, Morris; aufm Kampe, H. J. and Weickmann, H. K., **Small drops, liquid-water content, and transmission in clouds.** *Journal of Meteorology*, 11(5):428–430, Oct. **1954.** 9 refs., 4 eqs. **DWB**—Referring to previous correspondence (*see item* 5.3–312, March 1954, *MAB*), about Trabert's formula, FRITZ discusses uncertainty of liquid-water content estimations and suggests a method of determining presence of small drops in clouds. NEIBURGER agrees that liquid-water content should be measured directly, AUFM KAMPE and WEICKMANN consider that droplets below 1μ radius do not occur. (*Same item as* 6.3–231, March 1955, *MAB.*) *Subject Heading:* **1. Water content of clouds.**—*C.E.P.B.*

6F–301 551.508.7:621.398:551.578.11

Fujiwara, M. (*Met. Research Inst., Tokyo*), **A new radio-telemetering apparatus for measuring raindrop-size.** *Papers in Meteorology and Geophysics*, Tokyo, 5(1):41–46, April **1954.** 9 figs., 9 refs. **MH-BH**—The design and construction of a new radio-telemetering instrument for measuring raindrops employing filter-paper as a sensing element is described. The reliability of the method of the new radio-telemetering instrument is discussed. It is shown that the instrument is suitable for accurate measurements, especially for smaller drops. *Subject Headings:* **1. Raindrop size measurement 2. Balloon-borne telemetering systems.**—*Author's abstract.*

6F–302 548.5:551.311.11

Glen, J. W. and Perutz, M. F., **The growth and deformation of ice crystals.** *Journal of Glaciology*, 2(16):397–403, Oct. **1954.** 15 figs., 20 refs. English and German summaries p. 397. Also: Steinemann, Samuel, **Results of preliminary experiments on the plasticity of ice crystals.** *Ibid.*, 404–412. 9 figs., 25 refs. English and German summaries p. 404. **DWB**—1. Dendrites grown in water and from vapor formed crystals with hexagonal symmetry, elongated along an axis through edges. Cylindrical ice crystals were grown in glass tubes at different angles in water. Under strain those with 30° or 45° between optic and cylinder axes pulled partly into thin tapes due to slipping along base plane, but one with optic and cylinder axes coinciding did not pull into a tape. Details of structure (asterism, polygonization) revealed by X-ray are discussed. 2. Describes methods of determining orientation and crystallographic description of single crystals, and technique for studying shearing. "In pure shear two stages of creep exist, the first for a glide of 10–20 per cent in an undeformed crystal, the second for greater shears having a higher creep velocity. Both stages obey the law $\gamma = k\tau^n$, n being 2.3–4 in the first case and 1.3–1.8 in the second." γ is the strain rate and τ the resolved shear stress. "The deformed state above the transition remains stable and no recrystallization takes place in pure shear." *Subject Heading:* **1. Ice crystal formation.**—*C.E.P.B.* (*Partly from author's abstract.*)

6F–303 551.574.1:551.576.1

Grabovskiĭ, R. I., **Ob obrazovanii oblakov i atmosfernykh osadkov.** [Cloud formation and atmospheric precipitation.] *Priroda*, Moscow, 43(6):91–95, June **1954.** 2 figs., 3 refs. **DLC**—After discussing the theoretical mechanism of the formation of cloud droplets and the development of clouds, the author describes possible experimental verification of the theoretical model involving the relationship between a presumed decrease of the concentration of atmospheric chlorides with the corresponding increase in the number of cloud droplets. The experimental procedure involved the collection of cloud droplets by causing them to freeze upon a moving surface attached to an airplane. This device is described and illustrated. Chemical analysis of the chloride content carried out by the author at the University of Leningrad and by S. M. SHMETER at the Central Aerological Observatory (Moscow) gave a chloride concentration of 6.3 mg/litre and 8.0 mg/litre, respectively. An examination of the relationship between the concentration of chlorides in droplets and their radius shows that cloud droplets grow by condensation up to a radius of 13–14μ, that with increase

in radius from 14–15μ coagulation begins and that at a radius 20–25μ coagulation is the predominant factor in the growth of cloud droplets. (*Same item as* 6.1–239, Jan. 1955, *MAB.*) *Subject Headings:* **1. Cloud droplets 2. Cloud formation 3. Drop growth 4. Chloride content of air 5. Coagulation.** —*I.L.D.*

6F–304 551.594.12:551.574.1

Gunn, Ross, **Diffusion charging of atmospheric droplets by ions, and the resulting combination coefficients.** *Journal of Meteorology*, 11(5):339–347, Oct. **1954.** 2 figs., 12 refs., 47 eqs. Also: Phillips, B. B. and Gunn, Ross, **Measurements of electrification of spheres by moving ionized air.** *Ibid.*, 11(5):348–351, Oct. **1954.** 4 figs., 4 refs., 2 eqs. **DWB**—Neglecting small effects of space charge, expressions are found for average equilibrium free-charge carried by a droplet at rest and time-rate of increase of free-charge. The effective charging time at earth's surface is about 1000 sec (agreeing with observed time of 20 min). The effect of motion with respect to ionized air is considered. It is found that ions of both signs diffuse to the drop surface and many are neutralized; from known rate of production equilibrium values are found. Expressions are derived for ionic combination coefficients of neutral and charged droplets. Calculated values of free-charge on a freely falling droplet agree with observed values. Experimental verification is found in second article. PHILLIPS and GUNN describe apparatus for determining the charge on electrically isolated conducting spheres in a region of known positive and negative ion concentration. Measurements show that the equilibrium charge is proportional to $\ln \frac{N^+\mu_+}{N^-\mu_-}$, where N is ionic density and μ is ion mobility. Absolute temperature, air flow and radius of spheres are also factors. Results agree with theory set out by GUNN. (*Same item as* 6.4–7, April 1955, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Electrical charging of clouds.**—*C.E.P.B.*

6F–305 551.574.1

Gunn, Ross and Allee, Paul A. (*U. S. W. B., Physical Res. Div.*), **A three thousand cubic meter cloud chamber.** *American Meteorological Society, Bulletin*, 35(4):180–181, April **1954.** fig., ref. **MH-BH**—A huge spherical controlled cloud chamber (60 ft in diameter) has been built in Texas to assist in the U. S. Weather Bureau's cloud physics research. Smaller chambers are inadequate because of wall effects on the greater part of the chamber and consequent short lifetime of artificial clouds. In this chamber, supercooled clouds were produced at −10°C, which persisted for more than an hour and gave no indication of spontaneous crystallization. Rapid expansion of air from chamber allows an adiabatic cooling of cloud temperature of 50°C, so that warm clouds, supercooled clouds, or ice clouds can be produced at will. Also free water content, speed of expansion, nuclei count and character, ionization and drop size distribution in a cloud can be controlled carefully to suit any given experiment. *Subject Headings:* **1. Cloud chambers 2. Cloud physics research 3. Texas.** —*M.R.*

6F–306 551.574.1:551.578.41

Higuchi, Keiji (*Hokkaido Univ., Sapporo*), **A method for observation of falling snow particles.** *Meteorological Society of Japan, Journal*, 2nd Ser., 32(3):77–82, March **1954.** In Japanese, English summary p. 77. 5 figs., 6 refs. **MH-BH**—The shadow photograph method was applied to obtain a record of the form, size and mass of snow crystals. The apparatus used is described. About fifty pairs of records for various kinds of snow crystal shapes were obtained on Mt. Maisetsu in Hokkaido, in Feb. 1953. The relation between the mass and the dimension of snow crystals was sought from these records. Excepting the case of plane dendritic crystals, the results coincide fairly well with the results of the empirical formulas obtained by NAKAYA and TERADA. The empirical formulas for stellar and columnar crystals are newly obtained. *Subject Headings:* **1. Snow observation 2. Snow crystal formation 3. Photographic observation methods.**—*Author's abstract.*

6F–307 551.574.1

Hosler, C. L., **Factors governing the temperature of ice-crystal formation in clouds.** (In: American Meteorological Society and Royal Meteorological Society, **Proceedings of the Toronto Meteorological Conference, Sept. 9–15, 1953.** pub. **1954.** p. 253–261. 7 figs., table, 4 refs. **DWB**—Experiments are described for determining freezing point of water in capillaries, captive droplets and cloud chambers. In distilled water freezing point depended only on drop radius, mean increasing from −30°C at 25μ to −23° at 55μ and to −19° at 205μ. Effect of various substances as condensation nuclei is tabulated. One group has little effect in small concentration but depresses freezing point in high concentration; another group raises freezing point. In a cloud chamber, size of nuclei and resulting concentration of droplets formed on them affect freezing point. Results are attributed to role of interface between water and its surroundings in determining internal structure of the water mass. (*Same item as* 6.3–232, March 1955, *MAB.*) *Subject Headings:* **1. Freezing nuclei 2. Ice crystal formation.**—*C.E.P.B.*

6F–308 551.574.1:551.551:533.16

Ingebo, Robert D., (*Lewis Flight Propulsion Lab., Cleveland*), **Vaporization rates and drag coefficients for isooctane sprays in turbulent air streams.** *U. S. NACA, Technical Note*, No. 3265, Oct. **1954.** 39 p. 12 figs., 3 tables, 14 refs. **DWB**—A droplet camera developed at the NACA Flight Propulsion Laboratory, for obtaining drop-size distribution and drop velocity data in a turbulent air stream, is described and illustrated and the results of tests presented in tabular and graphic form and discussed. Evaporation rates and drag coefficients are also determined and data presented graphically. *Subject Headings:* **1. Drop size distribution 2. Evaporation rate of droplets 3. Drag coefficient of raindrops.**—*M.R.*

6F–309 551.576.1:551.501.7:551.507.352

Investigations of cumuliform cloud. *Meteorological Magazine*, London, 83(985):208–215, July **1954.** 2 refs. **MH-BH**—R. J. MURGATROYD opened the Meteorological Office discussion with a review of the work of the Meteorological Research Flight in the investigation of cumuliform clouds. He described clear-air investigations around and below the clouds, and conditions within the clouds—up-currents roughly assessed in ft/sec as 14 (temperature difference °F between environment and saturated adiabatic). He referred to water content, cloud particles, and the mechanism of shower production (often by coalescence). The discussion dealt mainly with coding of cloud reports by aircraft. (*Same item as* 5.10–185, Oct. 1954, *MAB.*) *Subject Headings:* **1. Cumulus clouds 2. Airplane weather reconnaissance. I. Murgatroyd, R. J.**—*C.E.P.B.*

6F–310 551.508.79:551.578.11

Johnson, John C.; Eldridge, Ralph G. and Terrell, James R., **An improved infrared transmissometer for cloud drop sizing.** Massachusetts Institute of Technology, Dept. of Meteorology, Contract AF 19(122)-245, Scientific Report, No. 4, July **1, 1954.** 48 p. 9 figs., 4 tables, 42 charts, eqs. Also: M.I.T., Dept. of Met., **Measurement of drop size distribution and liquid water content in natural clouds.** Contract No. AF19(122)-245, Final Report, Sept. **30, 1954.** 13 p. 11 refs. **DWB**—Report describes optical system for measurement of absolute drop size distribution in range from 2 to 30μ diameter, and liquid water content in natural clouds. Theory of relation of optical density to drop size and wave length, computation of transmission cross sections of partially absorbing spheres, by desk computers and by high speed digital computers, instrumental characteristics of the transmissometers, and field tests giving data on drop size distribution as observed, calibration procedures and results, analysis of observed transmissions and sample computations are given in numerous graphs, tables and charts. *Subject Headings:* **1. Transmissometers 2. Infrared cloud drop size meters.**—*M.R.*

6F–311 551.574.1

Keith, C. H. and Arons, A. B., **The growth of sea-salt particles by condensation of atmospheric water vapor.** *Journal of Meteorology*, 11(3):173–184, June **1954.** 9 figs., 3 tables, 18 refs., 21 eqs. Also as: Woods Hole Oceanographic Institution, Contract Nonr-798(00) (NR-085-001), Technical Report, No. 5, June **1953. DWB, MH-BH**—Equations of change of state of small particles of sea salt in air of 80–100% R. H. are set out. For particles of 10^{-9} to 2×10^{-8} gm time of growth to a saturated solution at 25°C is given by eq. (20) and expressed in a table and graph. An expression (17) is found for the change of concentration ("scaled radius," cm/gm$^{1/3}$). A setup is described for measuring growth rates at different σs and humidities. The experimental results agreed with the formulas derived. The growth equation is integrated for rates of lift and variable temperatures and humidities. The curves obtained trace the growth of salt particles from the sea to cloud base. (*Same item as* 5.9–216, Sept. 1954, *MAB.*) *Subject Headings:* **1. Saline nuclei 2. Drop growth theory.**—*C.E.P.B.*

6F–312 551.574.1

Kinoshita, Seiiti, **Measurement on the rate of growth of a water droplet containing a hygroscopic nuclei** (*sic*) **in moist air.** *Low Temperature Science, Sapporo, Japan, Ser. A, Physical Sciences*, 12:113–120, **1954.** 8 figs., 7 refs. In Japanese; English summary p. 119–120. **DWB**—The rate of growth of a water droplet with a hygroscopic nucleus in moist air was investigated. The rates of growth are shown by means of diagrams and photographs. *Subject Heading:* **1. Drop accretion rate.**—*From author's abstract.*

6F–313 551.578.11:531.52

Kumai, Motoi and Itagaki, Kazuhiko (*Hokkaido Univ. Sapporo*), **Shape and fall velocity of raindrops.** *Meteorological Society of Japan, Journal*, 2nd Ser., 32(3):69–76, March **1954.** In Japanese; English summary p. 69. 5 refs., 3 tables, 9 refs., 5 eqs. **MH-BH**—The shape and fall velocity of raindrops were observed by means of the photographs taken with a dark-field by electric sparks at 100 times/sec. Sixty-two successful photographs of raindrops were obtained. Various

waterdrops of known mass were photographed after 11 m fall in still air, and the relation between the mass, fall velocity and deformation were observed. Raindrops and waterdrops were compared with each other in shape and fall velocity. In still air, the shapes and fall velocities of raindrops and waterdrops were similar. The maximum fall velocity was 980 cm/sec, and the largest diameter was 0.51 cm. The drag coefficient of raindrop is discussed on the basis of these data. *Subject Headings:* **1. Raindrop shapes 2. Raindrop velocity 3. Drag coefficient of raindrops.**—*Authors' abstract.*

6F–314 551.574.1

Lévelesque, J., **Study of the size distribution of NaCl nuclei.** (In: Montreal. Univ. Dept. of Chemistry, **Use of a diffusion cloud chamber to characterize condensation nuclei.** Contract AF 19(122)-380, Final Report, May 31, **1954.**) p. 28–32. **MH-BH**—A further study has been made of the NaCl nuclei generated by a hot coil. This was conducted using an electrical charging and precipitating device for collection of the particles. The particles were collected on grids and examined in the electron microscope. A study of the particle distribution and the size distribution at different distances down the collector indicated that the nuclei were divided into groups of different sizes. Variation of experimental conditions pointed to factors influencing microcrystal formations. *Subject Headings:* **1. Saline nuclei 2. Nuclei distribution 3. Cloud chambers.**—*Author's abstract.*

6F–315 551.578.11

McDonald, James E., **The shape of raindrops.** *Scientific American*, 190(2):64–68, Feb. **1954.** illus. **DLC**—Presents high speed photographs which show that falling raindrops are not tear-shaped as is commonly believed, but are shaped (on the bottom) like a flat hamburger bun. If the internal pressure field exactly equals the external field on all sides, the drop will be spherical as in the case with fog and cloud droplets, but in falling, the external pressure is greater on the front than it is on the circumference or "waist." Thus the radius of curvature on the bottom can be shortened considerably if the drop is large enough and its fall fast enough. Some pressure also exists on the top to shorten its radius. Surface tension tends to keep the drop spherical until it achieves a size where hydrodynamic forces exceed surface tension. Aerodynamic (turbulence) reduction in pressure accounts for top not being flatter than the bottom. (*Same item as* 6.1–281, Jan. 1955, *MAB.*) *Subject Headings:* **1. Raindrop shapes 2. Cloud physics.**—*M.R.*

6F–316 551.574.1

McGinn, J. H., **A double image micrometer for particle size analysis.** *Review of Scientific Instruments*, 25(9):930–931, Sept. **1954.** 2 figs., ref. **DLC**—The instrument described in this note is a microscope whose optical system was modified by the addition of birefringent crystals so as to give double images. By counting the particles whose two images are tangent, the number of particles having diameters of a specified size can be readily obtained. The use of a graded series of crystals mounted on a sliding frame makes it convenient to determine the size distribution of particles over a number of size classes. *Subject Headings:* **1. Micrometrics 2. Particle counters.**—*G.T.*

6F–317 551.578.11

Magono, Choji, **On the shape of water drops falling in stagnant air.** *Journal of Meteorology*, 11(1):77–79, Feb. **1954.** 5 figs., 7 refs. **MH-BH**—Drops of 0.01% silver chloride solution falling at terminal velocity were photographed by spark discharges once per 0.01 sec. Fall velocity is plotted against drop diameter. Typical shapes are shown. Flattening is represented by minor/major diameter; ratio generally decreased with diameter but a few drops were elongated vertically, probably on leaving tip of dropper. (*Same item as* 5.9–239, Sept. 1954, *MAB.*) *Subject Headings:* **1. Raindrop shapes 2. Raindrop velocity.**—*C.E.P.B.*

6F–318 551.576.11

Malkus, Joanne Starr and Ronne, Claude, **Concerning the structure of some cumulus clouds which penetrated the high tropical troposphere.** Woods Hole Oceanographic Institution, Contract N60n4-27702, Project NR-082-021, Technical Report, No. 27, March **1954.** 38 p. 8 figs., refs. p. 35. **DWB**—Some extremely large oceanic trade-wind cumulonimbus clouds extending upwards of 40,000 ft into a region of strong winds and intense vertical shear have been studied by means of time-lapse photography. A simultaneous still picture of the clouds taken a known distance and direction away from the motion pictures permits triangulation upon the clouds and calculation of the vertical and horizontal motions of several of the individual towers. By means of a nearby radiosonde observations, it is established that the air forming the strongest of these towers must have risen from near cloud base with little or no dilution of its buoyancy by mixing with the clear-air surroundings. The model of Malkus and Scorer (1954) concerning the erosion of cumulus towers is reviewed and tested upon these towers with satisfactory results. A minimum horizontal cloud dimension is apparently required for the production of undiluted towers. The horizontal motion

of the clouds relative to the air is also estimated from the model and tested by the observations and the net upward transport of latent heat in water vapor is calculated approximately. (*Same item as* 5.11–153, Nov. 1954, *MAB.*) *Subject Headings:* **1. Cumulus cloud structure 2. Time lapse phottography 3. Cloud models 4. Cloud formations.**—*Authors' abstract.*

6F–319 551.558:551.553.21

Malkus, Joanne Starr, **Example of an orographic-convection cell in the trade-wind region.** Woods Hole Oceanographic Institution, Contract N6onr-27702, Project NR-082-021, Technical Report, No. 30, June **1954.** 26 p. 11 figs., 4 tables, 11 refs. "Unpublished manuscript." **DWB**—A series of four helical aircraft soundings across the island of Puerto Rico on a sea-breeze day are analyzed and interpreted. The observations give the height distribution of temperature, moisture, and small-scale turbulence at four verticals along the air flow, together with cloud observations which were supplemented by photography. The existence of a fairly symmetrical orographic-convection cell with ascent over the island and compensating subsidence in a surrounding ring is established. The field of motion in the convection cell is deduced from the observations together with the theoretical work on flow over heated islands by MALKUS and STERN (1953). The plausibility of the motion field is then tested by construction of a moisture budget for part of the cross section delineated by the soundings. *Subject Headings:* **1. Air flow over islands 2. Sea breezes 3. Orographic convection cell.**—*Author's abstract.*

6F–320 551.558.21:551.576.11

*Malkus, Joanne Starr, **On the formation and structure of downdrafts in cumulus clouds.** Woods Hole Oceanographic Institution, Contract N6onr-27702, Project NR-082-021, Technical Report, No. 31, Aug. **1954.** 14 p. 3 figs., 4 tables, 7 refs. **DWB**—It is found that the downdrafts in convective cumulus areas seem to originate at or near the top of the cloud updraft, and the downdraft air mixes with entrained or updraft air, not air surrounding the cloud. Otherwise the downdrafts might become much more severe. Data analyzed herein were taken from cloud traverses made on April 7, 1953 in the trade wind area. Data on gross entrainment and draft calculation in updraft and downdraft at 575, 793, 1109, 1420 and 1560 m are presented and discussed, including vertical speeds and evaporation. *Subject Headings:* **1. Vertical currents in cumulus 2. Downdrafts.**—*M.R.*

6F–321 551.578.11

Mason, B. J. and Ramanadham, R., **Modification of the size distribution of falling raindrops by coalescence.** *Royal Meteorological Society, Quarterly Journal*, 80(345):388–394, July **1954.** 2 figs., table, 8 refs., 3 eqs. **DWB**—Observations with photoelectric spectrometer are on the average represented by MARSHALL and PALMER'S exponential expression (1948) but a sample over several minutes may show marked deviations. Modifications of drop size spectrum by coalescence are calculated, starting with an exponential distribution 1 km above cloud base. These are shown in an extensive table. Accretion of cloud droplets by raindrops, and evaporation between cloud base and ground, shift spectrum towards larger sizes without greatly affecting shape of curve, increasing radar echo intensity at lower levels. (*Same item as* 6.1–282, Jan. 1955, *MAB.*) *Subject Heading:* **1. Raindrop size distribution.**—*C.E.P.B.*

6F–322 551.574.1:061.3

Mason, B. J., **Physics of cloud and precipitation.** *Nature*, London, 174(4438):957–959, Nov. 20, **1954. DWB**—Account of Symposium at Zurich Oct. 4–6, 1954. Contributions summarized include M. DESSENS on theories of cloud nucleation tested experimentally. B. J. MASON on physics of natural precipitation, E. M. FOURNIER D'ALBE on hygroscopic nuclei in Pakistan, O. VITTORI on microchemical tests, C.-G. ROSSBY on analysis of rainwater in Sweden, W. RAU on spectrum of freezing nuclei, G. SOULAGE on residues of evaporated ice crystals, and H. BYERS, F. H. LUDLAM, R. J. MURGATROYD, V. SCHAEFER, E. BOLLAY (cloud seeding), B. J. MASON and FOURNIER D'ALBE in a discussion on cloud physics. (*Same item as* 6.5–217, May 1955, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Symposia.**—*C.E.P.B.*

6F–323 551.574.1:551.578.11

Mordy, W. A. and Eber, L. E., **Observations of rainfall from warm clouds.** *Royal Meteorological Society, Quarterly Journal*, 80(343):48–57, Jan. **1954.** 9 figs., 2 tables, 16 refs. **DWB**—A very detailed study of rain on SE Oahu (Hawaii) in June 1952. Daily flights measured heights of tops and bases of clouds over mountains and windward coast; rain fell, sometimes heavily, with cloud 5000 ft or more thick; lowest cloud top temperature 7°C. Daily rainfall distribution is mapped and hourly area×intensity given by recording gages plotted. Raindrop sizes were recorded from aircraft. Cumulus crossing mountain range showed increase of vertical motion, liquid water and maximum size of raindrops. The cloud structure on a rainy trade-wind day shows stratiform cloud overlying cumuliform and seeding the latter with relatively large drops. It is calculated that cloud

oes not reach freezing level on more than half the annual number of raindays. (*Same item as* 9–8, Sept. 1954, *MAB.*) *Subject Headings:* **1. Rain from nonfreezing clouds 2. Rainfall distribution 3. Oahu, Hawaiian Islands.**—*C.E.P.B.*

6F–324 551.574.1:536.42

Mossop, S. C. and Bigg, E. K., **The freezing of cloud droplets.** *Royal Meteorological Society Quarterly Journal*, 80(345):455–457, July **1954.** fig., 2 refs. **DWB**—Referring to papers by Bigg (*see items* 5.3–239 and –240, March 1954, *MAB*), Mossop quotes observations of freezing of distilled water in capillary tubes at −32.9°C, S.D. 1.3. Bigg replies that presence of glass boundaries reduces freezing point. (*Same item as* 6.1–242, Jan. 1955, *MAB.*) *Subject Heading:* **1. Supercooling of water.**—*C.E.P.B.*

6F–325 551.594.2

Müller-Hillebrand, D. (*Stockholm*), **Charge generation in thunderstorms by collision of ice crystals with graupel, falling through a vertical electric field.** *Tellus*, 6(4):367–381, Nov. **1954,** figs., 4 tables, 23 refs., 25 eqs. **MH-BH**—When an ice-crystal impinges on the lower surface of a particle of hail or soft hail part of the charge induced by the electric field is transmitted to the ice-crystal. The relaxation time for the exchange of charge varies from a few milliseconds to about 10^{-6} second and is sufficiently short to enable this gain of charge. In a positive field the soft hail will therefore get a negative and the ice-crystal a positive charge. In an electric field E the final charge of a sphere with a radius R is $e_1 = -2.12\ ER^2$. At temperatures between −18° and −26° the number of ice crystals is sufficient to allow a time constant of about 5 minutes for the charging process. The charge per droplet and per gm of water derived from this process are in good agreement with measurements of Ross Gunn. The growth of precipitate and the formation of strong electric fields can be brought into correspondence with the timing and development of thunderstorms. *Subject Headings:* **1. Thunderstorm charge generation 2. Electric charges on drops 3. Electric charges on graupel.**—*Author's abstract.*

6F–326 551.594.2

Müller-Hillebrand, D., **The ion capture on polarised drops.** *Arkiv för Geofysik*, Stockholm, 2(10):197–225, **1954.** 17 figs., 10 tables, 13 refs., 86 eqs. **MH-BH**—History of theory of electrical charges on falling drops is reviewed and theory developed by aid of models. Discusses drops at rest in an electric field, droplets moving in an electric field, the inductive effect of the drop's surface, determination of the capture region, and effects on large or fast falling drops. The theory is developed in accord with that of C. T. R. Wilson, and results apply to ice as well as water drops. Charges are assumed to be at the center of a drop until disturbed and then become separated on the surfaces whence they can influence ions in the neighborhood—capturing unlike ions encountered in falling. Small drops in a thunderstorm acquire positive charges; large drops, negative. *Subject Headings:* **1. Thunderstorm charge generation 2. Electrical charges on drops 3. Wilson's thunderstorm theory.**—*M.R.*

6F–327 551.594.2

Müller-Hillebrand, D., **Limitations of the Wilson thunderstorm theory.** *Arkiv för Geofysik*, Stockholm, 2(11):227–244, **1954.** 7 figs., 3 tables, 13 refs., 30 eqs. **MH-BH**—Wilson's theory of thunderstorm charge generation is shown to have limits when compared with experimental observations (depending on drop size and diffusion processes). Observed charges, and time for build-up of charge indicate that Wilson's theory cannot account for preliminary stages in lightning process (i.e., when drops fall more slowly than ions) in limiting case when field strength × radius of drop $< 1.51 \times 10^{-4}$ ESU/cm. Three drop size distributions are differentiated: 1) mist, 2) fair weather cumulus and 3) cumulonimbus. Excess charge is sufficient at first to produce a field of 1V/cm in a few minutes at 7000 m as soon as precipitation begins. In 30 min the field increases to 300 V/cm (maximum 320 V/cm for radius 1 mm). Wilson's process cannot explain charges of 3000 V/cm in 10–15 min. *Subject Headings:* **1. Thunderstorm charge generation 2. Wilson's thunderstorm theory.**—*M.R.*

6F–328 551.578.41 546.212:548

Nakaya, Ukichiro, **Formation of snow crystals.** *U. S. Snow, Ice and Permafrost Research Establishment, Research Paper*, No. 3, Jan. **1954.** 12 p. 14 figs., bibliog. p. 12. **MH-BH**—Proposes to distinguish between ice crystals (10–300μ) and snow crystals (500–4000μ). The type of crystals formed depends on temperature and supersaturation. Results for natural snow crystals in this respect, according to Gold and Power, agree with artificial snow data by Nakaya and Hanajima. A classification of ice crystals is proposed showing that the types depend on temperature in essentially the same way as the types of snow crystals. The growth of snow crystals is explained by surface diffusion of H_2O molecules from minute droplets come into contact with the ice surface.

Some aspects of artificial seeding are discussed. (*Same item as* 6.2–273, Feb. 1955, *MAB*) *Subject Headings:* **1. Snow crystals 2. Ice crystals 3. Cloud physics 4. Cloud seeding.**—*A.A.*

6F–329 551.574.

Ogiwara, Sekiji and Kobayashi, Teisaku, **On the growth of water droplets around hygroscopi particles in convective cloud and its application to the artificial rainmaking.** *Low Temperatur Science, Sapporo, Japan, Ser. A, Physical Sciences*, 12:94–111, **1954.** 10 figs., 5 tables, 11 refs In Japanese; English summary p. 112. **DWB**—The degree of supersaturation in a convectiv cloud was estimated with the aid of WEICKMANN's and AUFM KAMPE's observational data on th physical characteristics of cumulus clouds and the growth of water droplets around hygroscopi particles by condensation and coalescence was studied. It is concluded that a droplet containin more than about 10^{-9} gm of sea salt can become a raindrop in a convective droplet cloud. The effec of seeding cumulus clouds with NaCl sprayed from ground based generators is analyzed synoptically and statistically. *Subject Headings:* **1. Hygroscopic nuclei 2. Drop growth 3. Artificial precipita tion.**—*I.L.D.* (*based on authors' abstract*).

6F–330 536.421:551.574.

Ouchi, K. (*Akita Univ.*), **Freezing mechanism of supercooled water.** *Tohoku University Science Reports, 5th Ser., Geophysics*, 6(1):43–61, Aug. **1954.** 7 figs., 5 tables, 16 refs., eqs. **MH BH**—The author builds up a hypothesis on the freezing of supercooled water based upon three assumptions, namely the assumption on the interfacial free energy between ice and water, the assumption of the shape and direction of the ice bud which forms on the surface of freezing nucleus and the assumption on the epitaxy of the ice bud on the surface of freezing nucleus. Critical tem peratures of the ice particle formation at −41°C, −32°C and others are explained by this hypothesis The effects of 17 sorts of freezing nuclei on the freezing temperature of supercooled water droplets are also explained reasonably and systematically by this hypothesis. *Subject Headings:* **1. Freezing of water 2. Supercooled water.**—*Author's abstract.*

6F–331 551.574.1

Ouchi, K. (*Akita Univ.*), **A study of the freezing process of supercooled water.** *Meteorological Society of Japan, Journal*, 2nd Ser., 32(5/6):119–128, May/June **1954.** 3 figs., 5 tables, 16 refs. 4 eqs. In Japanese; English summary p. 119. **MH-BH**—Starting from certain basic assumptions regarding the mechanism of freezing of supercooled water, the author determines theoretical values of (1) increase of free energy due to the formation of an ice bud, (2) temperature at which an ice bud of a given size will form, (3) nucleation rate of an ice bud in a water droplet and (4) maximum radius of an ice bud determined by the lattice structure of the nuclear surface. −41°C is believed to be the temperature at which an ice bud, consisting of 6 molecules or 24 molecules, forms in a droplet of supercooled water, and −32°C the eutectic point of a thin layer of NaCl solution which is enveloped by newly condensed water and which envelops the freezing nucleus of a NaCl crystal. These values agree with those obtained by other investigators. *Subject Headings:* **1. Freezing of water 2. Supercooled water.**—*From author's abstract.*

6F–332 551.574.1

Picca, Robert, **Études sur la surfusion de gouttelettes d'eau.** [Studies on the supercooling of water droplets.] *Puy-de-Dôme. Observatoire, Bulletin*, [Ser. 2] No. 2:33–42, April/June **1954.** 5 figs., 6 refs. **DWB**—The experimental procedure for studying supercooled water droplets involved their collection by the use of spider threads or of plexigum fibers which are placed in a small enclosure cooled by an external sleeve, in which the freezing mixture was composed of acetone and dry ice. The water droplets are produced by introducing humid air into a previously cooled enclosure. The cold chamber is described in detail with the aid of a diagram. Data show that the freezing of water droplets depends upon the diameter of the droplet, its rate of cooling and the duration of its life. A study of the effect of contamination of the threads in the silver iodide upon the droplets shows that if the contaminated fibers are introduced into the chamber cooled previously to −4°C the insufflation of water vapor results in droplets which normally freeze between −4° and −6°C, while if the threads are introduced into the chamber at a temperature of −5°C the insufflation yields droplets which do not freeze. (*Same item as* 6.2–244, Feb. 1955, *MAB.*) *Subject Headings:* **1. Supercooled water drops 2. Nucleation theory.**—*I.L.D.*

6F–333 551.582:551.576.11(51)

Ramage, C. S. (*Royal Observ., Hong King*), **Non-frontal crachin and the cool season clouds in the China Seas.** *American Meteorological Society, Bulletin*, 35(9):404–411, Nov. **1954.** 8 figs., table, 10 refs. **MH-BH**—The crachin of the coastal regions of south China and Northern Indochina develops during the cool season whenever relatively moist air is cooled sufficiently by contact with the cold coastal waters to lower its condensation level below the level of turbulent mixing.

nter-mensal and diurnal variation of crachin are discussed as well as its coincidence with low-level vinds veering with height. Forecasting procedures are listed. Over the China Seas beyond the rachin zone, convective cloud predominates, but as sea-air temperature differences steadily decrease hrough the latter part of the cool season, cloud amounts also diminish. *Subject Headings:* **1. Crachin eason 2. Convective clouds 3. China Seas.**—*Author's abstract.*

6F–334 551.574.1

Rau, Walter, **Gefrierkerngehalt und Gefrierkernspektrum des natürlichen Aerosols.** [Freezing nuclei content and freezing nuclei spectrum of natural aerosol.] *Meteorologische Rundschau*, 7(3/4): 59–64, March/April **1954.** 8 figs., table, 19 refs. **DWB**—Numbers of freezing nuclei in outside air, exhaled air and room air were measured in a cloud chamber as 0.05/cc effective at −10°C and 0.5 at −20°C. There was little increase between −14 and −28°C, a rapid rise below −28°. Room air showed a secondary maximum about −20°C. Measurements by other investigators are compared. Temperature frequency spectra of freezing nuclei formed by drops of different sizes in artificial fog and natural aerosol are compared. (*Same item as* 5.8–194, Aug. 1954, *MAB.*) *Subject Headings:* **1. Freezing nuclei 2. Nuclei count.**—*C.E.P.B.*

6F–335 551.577.11

Rigby, E. Caroline; Marshall, J. S. and Hitschfeld, Walter, **The development of the size distribution of raindrops during their fall.** *Journal of Meteorology*, 11(5):362–372, Oct. **1954.** 15 figs., 15 refs., 14 eqs. **DWB**—Distribution during fall is inferred from observed distribution at ground, in steady rain and showers. Changes due to collisions, accretion of cloud and evaporation of drops are examined quantitatively; none basically alter form of distribution. Development, descent and vertical expansion of radar Z during a shower are computed and shown for times 0, 300 and 600 sec and compared with observed rate of descent of radar echoes from showers. An appendix by K. L. S. Gunn discusses depletion of cloud through accretion by falling rain. (*Same item as* 6.3–257, March 1955, *MAB.*) *Subject Headings:* **1. Precipitation mechanism 2. Raindrop size distribution. I. Gunn, K. L. S.**—*C.E.P.B.*

6F–336 551.578.11

Sartor, Doyne, **A laboratory investigation of collision efficiencies, coalescence and electrical charging of simulated cloud droplets.** *Journal of Meteorology*, 11(2):91–103, April **1954.** 8 figs., 4 tables, 16 refs., 9 eqs. **MH-BH**—Reynolds numbers are calculated for drops of 5–50μ. Drops of distilled water of sizes to give these Reynolds numbers fell through a tank of mineral oil and relative trajectories of large and small drops were plotted. Most of the runs resulted in collision but not coalescence, collision efficiency being 2–3 times that given by Langmuir's theory, because large drops tended to follow wakes of smaller drops. When an electric field was applied, drops coalesced with frequencies increasing with field strength up to 250 v/cm (100% coalescence). Relative positions of drops on coalescence depended on strength of field. Coalescence was due to redistribution of charges on the two drops. The process is analyzed and shown to agree quantitatively with observations of charge distribution in thunderstorms. (*Same item as* 5.8–9, Aug. 1954, *MAB.*) *Subject Headings:* **1. Raindrop coalescence 2. Electrical changes on drops.**—*C.E.P.B.*

6F–337 551.574.1

Schaefer, Vincent J., **The concentration of ice nuclei in air passing the summit of Mt. Washington.** *American Meteorological Society, Bulletin*, 35(7):310–314, Sept. **1954.** 3 figs., 4 refs. **MH-BH**—Ice nuclei concentration at a temperature of −16°C to −20°C was measured by drawing samples of air into a specially designed box (shown in a diagram) in which a supercooled cloud is formed and the number of ice crystals in the cloud is estimated. Observations were made over a period of eight months. The yearly fluctuations in relative nuclei concentration showed a maximum of low point values in June-Aug. and a minimum of low point values starting about Dec. Also the annual variation in ice nuclei count is analyzed separately for each year. Starting with 1950, each successive year showed the period of maximum low count in the summer months to be less marked until in 1953 it had nearly disappeared. A typical chart showing several air trajectories related to high count periods is included. *Subject Headings:* **1. Ice nuclei 2. Nuclei count 3. Mt. Washington, New Hampshire.**—*I.L.D.*

6F–338 551.574.1

Schaefer, Vincent J., **The measurement of high concentrations of ice nuclei in a small parcel of air.** *American Meteorological Society, Bulletin*, 35(5):230–233, May **1954.** 3 figs., 7 refs. **MH-BH**—A method for determining the initial concentration of ice crystals in an aerosol sample and the subsequent behavior of these particles having a delayed reaction is described. The cold chamber and nebulizer used as a source of moisture to maintain a supercooled cloud in equilibrium with the chamber and the experimental conditions are described with the aid of diagrams. Ice crystals are

produced by holding a piece of dry ice above the chamber and scratching it with a knife edge so that grains of dry ice fall into the chamber. The number of crystals in the chamber is determined by estimating the distance separating individual particles. Three types of time-concentration curves are described: 1) where ice crystals produced by methods which form them spontaneously, 2) foreign particles serve as nuclei for ice crystal formation and 3) a chemical reaction occurs in the chamber. The use of type (1) curve to indicate the initial value of crystal concentration is discussed. *Subject Headings:* **1. Ice crystal concentration 2. Ice crystal formation.**—*I.L.D.*

6F–339 551.574.1

Sciarra Mortola, Luisa, **La fase del ghiaccio nell'atmosfera: nuclei di sublimazione e di congelamento.** [The ice phase in the atmosphere: sublimation and freezing nuclei.] *Geofisica e Meteorologia*, Genoa, 2(1/2):5–8, Jan./April **1954.** 3 figs. **DWB**—Results obtained by new techniques for counting freezing nuclei are graphically presented: the concentration of crystals as a function of pressure and the diameter of crystals as a function of temperature. Reviews the studies of freezing nuclei in expansion chambers, and the discovery of new mathematical techniques from statistical data based on systematic observation—as that conducted by Observatory of Mt. Washington—which give more meaning to the study of the solid phase of the atmosphere. *Subject Headings:* **1. Ice nuclei 2. Nuclei count 3. Sublimation nuclei 4. Mt. Washington, N. H.**—*L. Piermarini.*

6F–340 551.574.1:551.509.67

Serpolay, R., **Action de certains liquides frigorigènes sur les nuages surfondus.** [Effect of certain cold-producing liquids on supercooled clouds.] *Puy-de-Dôme. Observatoire, Bulletin*, [ser. 2], no. 4:99–102, Oct./Dec. **1954.** 3 figs. **DWB**—Some cold-producing liquids, like dichlorofluoromethane (b.p. −30°C) and methyl chloride (b.p. −24°C), give rapidly a very large number of ice crystals when they are sprayed in supercooled clouds just below 0°C. The earliest experiments (1953) have been conducted on artificial clouds produced in close atmosphere (home freezer or refrigerating room). Some field experiments recently extended the results obtained in laboratory to the natural supercooled fogs or stratus. *Subject Headings:* **1. Cloud seeding 2. Ice crystal formation.**—*Author's abstract.*

6F–341 551.574.1(02) 551.594.2(02)

†Shishkin, N. S., **Oblaka, osadki i grozovoe elektrichestvo.** [Clouds, precipitation and thunderstorm electricity.] Moscow, Gosud. Izdat. Tekhniko-Teoreticheskoi Literatury, **1954.** 280 p. 82 figs., 21 tables, 156 refs. **DLC**—An important monograph or text on various aspects of cloud physics and thunderstorm electricity. The work reported is based on original Russian as well as on "western" research up through 1953 (in the list of 156 references, 93 are from native Russian and 63 from foreign sources). In the introduction the author critically reviews the various theories of cloud physics and rain formation (i.e., FINDEISEN-BERGERON, BOWEN, LANGMUIR, etc.), then in Ch. 1 takes up the dynamic processes in water-vapor transfer and cloud formation, cloud forms, and precipitation types; Ch. 2, the methods of cloud and raindrop, and water content measurement; Ch. 3, the microstructure of cloud, and radar measurements; Ch. 4, laboratory research on growth, evaporation and freezing of cloud drops, and crystal growth; Ch. 5, on condensation and sublimation as factors in cloud particle growth; Ch. 6, on coagulation of various types as factors in particle growth; Ch. 7, changes in phase involved in growth or formation of hydrometeors; Ch. 8, basic theory of convective clouds, thunderstorms and hail; Ch. 9, electrical fields in clouds and Ch. 10, basic theory of thunderstorm electricity. The book contains a great deal of theory, and quantitative data in the form of tables and curves, scatter diagrams and histograms. The illustrations of radar scope views are taken from U. S. material, but most of the illustrations are from U.S.S.R. sources. (*Same item as* 6.3–1, March 1955, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Thunderstorm electricity 3. Textbooks.**—*M.R.*

6F–342 551.578.11

Shishkin, N. S., **Razmery kapel' dozhdia.** [The size of raindrops.] *Priroda*, Moscow, 43(10): 90–92, Oct. **1954.** 4 figs. **DLC**—The size frequencies of raindrops of continuous rainfall, drizzle, rain and thunderstorm rain are shown graphically. The curves are similar but the maximum drop radius for the continuous rain is 1.1 mm, for drizzle rain 2.2 mm and for thunderstorm rain 2.7 mm; the highest frequency of raindrop size is 0.5 mm, about 0.5 mm and 1.0 mm, respectively. The radius of raindrops from aqueous clouds increases as the updraft velocity increases. *Subject Heading:* **1. Raindrop sizes.**—*I.L.D.*

6F–343 551.508.91:551.507.352:551.574.1:551.509.67

Smith, E. J. and Heffernan, K. J., **Airborne measurements of the concentration of natural and artificial freezing nuclei.** *Royal Meteorological Society, Quarterly Journal*, 80(344):182–197, April

1954. 10 figs., 5 tables, 11 refs. **MH-BH**—An apparatus for observation of freezing nuclei by aircraft is described. Number of ice crystals estimated visually was recorded as a function of temperature and converted to concentration of freezing nuclei by an experimental factor obtained with silver iodide smoke. Observations of natural freezing nuclei on 31 flights near Sydney, Australia, are analyzed. Temperature of complete glaciation was $-35\frac{1}{2}\pm1°C$, highest temperature for 1 crystal/liter was around -20 to $-24°C$. Concentration of nuclei around a silver iodide generator on the ground was plotted up to 1200 m height. (*Same item as* 5.9–10, Sept. 1954, *MAB.*) *Subject Headings:* **1. Nuclei counters 2. Cloud seeding 3. Condensation nuclei 4. Sydney, Australia.**—*C.E.P.B.*

6F–344 551.574.1 532.5

Stuke, Bernward, **Die Bewegung von Gasblasen und Flüssigkeitstropfen.** [The motion of gas bubbles and liquid drops.] *Umschau*, 54(23):715–717, Dec. 1, **1954.** 10 figs. **DLC**—The boundary layer of a moving gas bubble in liquid or a liquid droplet in gas may be continually renewed or carried with the droplet, depending on rigidity of the latter. Bubbles in pure water reach a maximum velocity of 35 cm/s with diameter about 1 mm; larger bubbles are deformed and velocity falls to 23 cm/s when diameter of equal-volume sphere is 6 mm. Above this velocity increases again. Minute quantities of capillary-active substances in solution in the water suppress the maximum at 1 mm. Sideways motion is considered as in a disc falling in air; it may lead to spiral motion or to formation of vortex rings. *Subject Headings:* **1. Water drops 2. Fluid dynamics.**—*C.E.P.B.*

6F–345 551.574.1

†U. S. Dugway Proving Ground, Utah, **Physics of cloud diffusion.** Sept. 15, **1954.** 36 p. 109 refs. **DWB**—Problems relating to knowledge of aerosol and gaseous cloud physics as affecting research programs at Camp Detrick, Md., and Dugway Proving Ground, Utah, are outlined. These include studies of climatology or microclimatology of specific areas involved. Annex I lists theory, application of theory and empirical studies a) already known and b) to be studied in the future. Studies of temperature, soil temperature, lapse rate, surface roughness, relative humidity, topography effects, synoptic meteorology, climatology and effects of pollutants are also to be made. A bibliography on turbulent diffusion is appended. *Subject Headings:* **1. Cloud physics research 2. Cloud diffusion.**—*M.R.*

6F–346 551.574.1

*Vaughan, Harry C. (*Mass. Inst. of Techn.*), **The spontaneous freezing temperatures of melted snow and of small water drops.** *American Meteorological Society, Bulletin*, 35(2):52–55, Feb. **1954.** 2 tables, 7 refs. **MH-BH**—The spontaneous freezing temperatures of samples of melted snow collected at hourly intervals during several storms are reported. The freezing temperatures were found to range from -8.3 to $-16.8°C$. In most cases the freezing temperature remained fairly constant over periods of several hours. Gross variations in the pollution of the lower atmosphere caused no obvious effect on the observed freezing temperatures. It is suggested that the observed freezing temperatures of small drops were made with a technique such that all drops were formed from the same bulk sample without any danger of contamination. In all cases the freezing temperatures of the drops were well below that of the bulk water. The freezing temperature decreased with decreasing drop size but there was a relatively large variation for a given drop size. (*Same item as* 6.2–247, Feb. 1955, *MAB.*) *Subject Headings:* **1. Spontaneous freezing 2. Freezing nuclei.**—*Author's abstract.*

6F–347 551.578.11:551.574.1

Wexler, Raymond, **Growth of rain in warm clouds.** Woods Hole Oceanographic Institution, Contract N6onr-27702 (Nr-082-021), Technical Report, No. 28, May **1954.** 23 p. 4 figs., 4 tables, refs. p. 21–22. **DWB**—Observations and theory of rain from warm clouds are reviewed. An analysis of the role of giant sea nuclei in these clouds indicates that there is a critical nucleus size which can become the largest raindrops, while larger nuclei become smaller raindrops. A theoretical analysis is made of the production of rain in warm clouds. The theory is applied to the mean data taken by BLANCHARD in orographic rain in Hawaii. Mean liquid water contents of about 1 g m^{-3} and updraft velocities of about 1 m sec^{-1} in light rain and about 3 m sec^{-1} in heavy rain are found. *Subject Headings:* **1. Condensation nuclei 2. Cloud drop growth 3. Rain formation 4. Rain from nonfreezing clouds 5. Hawaii.**—*Author's abstract.*

6F–348 551.574.1

*Woodcock, A. H. and Mordy, W. A., **Salt nuclei, wind and daily rainfall in Hawaii.** Woods Hole Oceanographic Institution, Contract Nonr-798(00) (NR-085-001), Technical Report, No. 9, Aug. **1954.** 19 p. 8 figs., table (fold.), 17 refs. **DWB**—The discovery of large sea-salt particles at cloud levels led to the hypothesis that these particles act as nuclei on which raindrops initially

form within clouds and to the suggestion that the amount of rainfall on an oceanic island might be a function of the number of the salt particles in the air. Exploratory observations of rain and airborne salt in Hawaii, which were intended to test this suggestion, are presented and discussed. These observations do not prove that greater numbers of salt nuclei are related to greater amounts of rain. They do, however, in the authors' opinion, indicate that such a relationship may exist and that a further more detailed field study should be made which utilizes the pertinent results of the present study. *Subject Headings:* **1. Saline nuclei 2. Rainfall data 3. Hawaii.**—*Authors' abstract.*

1955

6F–349 551.578.11

†Alpert, Leo (*Capitol Res. and Dev. Corp., Arlington, Va.*), **Notes on warm-cloud rainfall.** *American Meteorological Society, Bulletin,* 36(2):64–68, Feb. **1955.** 4 figs. (incl. photos), 2 tables, 48 refs. **MH-BH**—After reviewing the literature on warm cloud rainfall in Puerto Rico, the author describes the characteristics of cumulus clouds from which rain fell in Puerto Rico. A description of the growth of a rain cloud from below to above the 0°C level is presented. A map showing the distribution of observations of warm cloud rainfall and photographs of warm cumulus rain clouds in Puerto Rico are shown. *Subject Headings:* **1. Rain from nonfreezing clouds 2. Puerto Rico.**—*I.L.D.*

6F–350 551.577.1:551.524.7

Bemis, Alan C., **The role of melting snow in the atmosphere.** *Journal of Meteorology,* 12(2): 186–188, April **1955.** fig., 7 refs. **DWB**—Suggests "freezing level" should be renamed "melting level." Snowflakes change by coalescence into large aggregates, subsequently melting. Fall velocity increases. An isothermal layer at 0°C forms with an unstable layer below, and vertical motion of the air which increases the amount of precipitation. *Subject Heading:* **1. Melting level.**—*C.E.P.B.*

6F–351 551.574.1:551.508.765:551.501.7

Brown, Edward N. and Willett, Jack H. (*Chic. Univ., Cloud Physics Project*), **A three-slide cloud droplet sampler.** *American Meteorological Society, Bulletin,* 36(3):123–127, March **1955.** 6 figs., 10 refs. **MH-BH**—A cloud droplet sampler for use in airplane soundings has been developed by the Cloud Physics Project of the University of Chicago. Various techniques of particle collection [impingement or inpaction, photographic, electronic (charge) and light scattering techniques] are described. The present sampler is based on Golitzine's (1951) impingement technique, using 3 movable slides. Collection efficiency, sources of error, and results obtained in Puerto Rico by the Cloud Physics Project from Nov. 1953 to March 1954 are discussed and illustrated by charts, photographs and schematic diagrams. *Subject Headings:* **1. Cloud droplet sampling 2. Air-borne cloud drop sampler 3. Puerto Rico.**—*M.R.*

6F–352 551.576.1:551.577.36

Byers, Horace R. and Hall, Robert K., **A census of cumulus-cloud height versus precipitation in the vicinity of Puerto Rico during the winter and spring of 1953–1954.** *Journal of Meteorology,* 12(2):176–178, April **1955.** 3 figs., ref. **DWB**—Simultaneous flights were made at cloud top and through trade cumuli near Puerto Rico. Over sea clouds giving a precipitation echo increased from 0 below 6000 ft top to 100% at 11,500 ft (freezing level 13,500 to 15,000 ft). Relations were found to ambient humidity and to the presence of stable layers. About 53% of the clouds developed precipitation during their life cycle. *Subject Headings:* **1. Cumulus clouds 2. Precipitation probability in trade wind cumulus 3. Rain from nonfreezing clouds 4. Puerto Rico.**—*C.E.P.B.*

6F–353 551.574.1:551.594.25

Gunn, Ross, **The statistical electrification of aerosols by ionic diffusion.** *Journal of Colloid Science,* 10(1):107–119, Feb. **1955.** 4 figs., 5 refs. 24 eqs. **DLC**—An earlier paper (*see* 6F–304) worked out the *systematic charge* transferred to cloud drops by ionic diffusion. The present paper examines the quantitative distribution of *random charges* accumulated by diffusion onto spherical particles. The analysis shows that in typical cases about half of the particles are positively charged and the other half negatively charged. Nearly every particle carries at least one electronic charge and some twenty or more. Expressions are developed for the statistical distribution of the fractional number of droplets in relation to their charge. When particle collisions are infrequent, the average free charge of the positive and negative fractions depends only on the square root of the radius and the mean thermal energy of each droplet. It is shown that an equipartition is established between the electrical potential energy of each drop and its thermal kinetic energy. Typical particle electrification somewhat increases the coagulation rate normally attributable to diffusion alone. Systematic droplet electrification of a selected sign is superimposed on this random charging if the positive and negative light ion conductivities of the environment have appreciably different values. The calculated distribution and average charge magnitude agree with those observed on silica dust and new

measurements on cloud particles. *Subject Headings:* **1. Electrical charges on drops 2. Ionic diffusion in clouds.**—*M.R. and author's abstract.*

6F–354 551.578.11:551.594.25

Gunn, Ross, **The systematic electrification of mist and light rain in the lower atmosphere.** *Journal of Geophysical Research*, 60(1):23–28, March **1955.** fig., 12 refs., 2 eqs. **DWB**—The role of ionic diffusion in placing free electrical charge on droplets falling in the atmosphere is considered. Experimentally verified expressions for the diffusion of ions onto droplets are shown to account for the sign and magnitude of the free charge observed on light rain and mist. In the lower atmosphere, such droplets are normally positive and carry a specific free charge approximating 1 esu/gm. The observed variability of the electrical conductivity of the atmosphere suggests that diffusion may occasionally transfer large negative as well as positive charges to the falling drops. *Subject Heading:* **1. Electrical charges on drops.**—*Author's abstract.*

6F–355 536.421:546.212

Hosler, Charles L. and Hosler, C. Robert (*Penna. State Univ. Dept. of Meteorology*), **An investigation of the freezing of water in capillaries.** *American Geophysical Union, Transactions*, 36(1):126–132, Feb. **1955.** 4 figs., 4 tables, 18 refs. **MH-BH**—In order to isolate the factors governing the freezing point of cloud and precipitation elements, experiments have been made to measure the effects of physical dimension and of certain ions in solution upon the freezing temperature of water in glass capillaries. The results of these experiments indicate that the freezing point of water in capillary tubing is the only physical dimension that affects the freezing point of water increased or diminished by the addition of certain ions in solution. The magnitude and sign of the change in freezing point are functions of the type of ions in solution, the molar concentration of the ions, and the capillary radius. (*See also item* 6F–179.) *Subject Heading:* **1. Freezing point of water.** —*Authors' abstract.*

6F–356 551.578.11:531.66

Manley, R. St. J.; Arlov, A. P. and Mason, S. G., **Rotations, orientations and collisions of suspended particles in velocity gradients.** *Nature*, London, 175(4459):682–683, April 16, **1955.** 7 refs., 3 eqs. **DWB**—Rods subjected to a rotational force in a sheared liquid tended to lie with their axes horizontal. With solid spheres of radii a_1 and a_2, down to $a_1/a_2=\frac{1}{2}$ the number of collisions was given by $\frac{1}{6}(a_1+a_2)^3 n_2 G$, where n_2 is the number concentration of the larger spheres and G is a rotation term. With a_2 less than half a_1 the smaller particle tends to move round the larger. *Subject Heading:* **1. Collision of spheres.**—*C.E.P.B.*

6F–357 551.574.1:551.596.1

Sänger, Raymund and Spring, Fritz (*Zurich*), **Durchgang von Explosionswellen durch unterkühlte Wolken.** [Penetration of explosive waves through supercooled clouds.] *Zeitschrift für angewandte Mathematik und Physik*, 6(1):75–76, Jan. 25, **1955.** English summary p. 76. **DLC**—In connection with experiments with rocket borne explosives for hail suppression, clouds with temperatures of −18°, −19°, −14° and −19°C, respectively, were probed to see if any effect was produced by the explosive wave passing through the supercooled cloud. Results were negative, i.e., no effect was detected. *Subject Headings:* **1. Cloud physics 2. Hail rockets 3. Cloud modification experiments 4. Switzerland.**—*M.R.*

6F–358 551.574.1:551.508.91

Schaefer, Vincent J. (*Munitalp Foundation*), **Simple experiments in atmospheric physics, Pt. 1.** *Weatherwise*, 8(2):48–49, 58, April **1955.** 3 figs. **DWB**—Diagrams and photo show construction of a home-made chamber such as was used by the author to make his first cloud seeding experiments. Text gives specifications and possibilities for experimental work on cloud physics and supercooled fog. *Subject Headings:* **1. Cloud chambers 2. Cloud physics experiments.**—*M.R.*

6F–359 551.574.1:551.578.41

Shaw, D. and Mason, B. J., **The growth of ice crystals from the vapour.** *Philosophical Magazine*, Ser. 7, 46(374):249–262, March **1955.** 10 figs., 2 tables, 11 refs. **DWB**—Single ice crystals were grown on a metal plate in a cold chamber. Forms: −5 to −9°C, prisms; −9 to −25°C, plates; below −25°C, prisms. Prisms formed below −5° but grown at 0 to −5°C developed into plates. At −4 to −8° and below −22°C some crystals took the form of a column with a pyramid at one end only. Under fixed conditions $dR^2/dt=$const., where R is a linear crystal dimension, but ratio of growth on basal to prism faces varied from 1.4 to 0.4 with temperature. Crystallographically similar faces sometimes grow at different rates which might change abruptly. Limiting habit of a crystal did not depend on rate of mass increase. At constant temperature dR was proportional to σ^2 ($\sigma=$supersaturation) except for very high or low σ. Crystal habit was independent of σ. Under

large subsaturation edges and corners were rounded by evaporation. *Subject Headings:* **1. Snow crystal growth 2. Ice crystal forms.**—*C.E.P.B.*

6F–360 551.577.1

Squires, P., **Project "Shower": an investigation on warm rain in the Hawaiian Islands.** *Nature*, London, 175(4461):748–750, April 30, **1955.** fig. **DWB**—Account of a full air and ground investigation of rainfall at Hawaii which forms entirely above freezing point. The branch of the trade which crosses the saddle between Mauna Kea and Mauna Loa was studied in detail, including raindrop spectra, salt content, liquid water, etc. A great mass of information was collected for future publication. *Subject Headings:* **1. Rain from nonfreezing clouds 2. Project "Shower" 3. Hawaii.** —*C.E.P.B.*

6F–361 551.508.765:551.574.1:551.578.11

Telford, J. W.; Thorndike, N. S. and Bowen, E. G., **The coalescence between small water drops.** *Royal Meteorological Society, Quarterly Journal*, 81(348):241–250, April **1955.** 8 figs., table, 12 refs. **DWB**—A wind tunnel is described for measuring the collection efficiency of drops of nearly equal diameter. It was found that the chances of such drops coalescing are very much higher than previously expected. This is explained in terms of the airflow in the wake of a falling drop. Electrostatic charges of opposite sign of about 10^{-13} coulomb increased the collection efficiency of 130μ drops two or three times; charges of the same sign inhibited coalescence. *Subject Headings:* **1. Coalescence 2. Electrical charges on drops.**—*C.E.P.B.*

SUPPLEMENTARY MATERIAL

6F–362 551.576.11 551.576.12

Bricard, J., **La formation des nuages.** [Formation of clouds.] *La Météorologie*, 4th Ser., No. 35:239–247, July/Sept. **1954.** 7 figs., 2 plates. French, English and Italian summaries p. 239. **DWB**—A brief outline of the general aspect of the clouds and of the international classification is given, and the stability and instability of the atmosphere defined. Then the mechanism of the formation of the principal clouds is examined: vertical development of clouds, continuous layers of clouds and the clouds in split layers. The influence of relief and a study of cloud systems concludes the article. *Subject Headings:* **1. Cloud formation 2. Cloud classification.**—*Author's abstract.*

6F–363 551.594.25:551.578

Chapman, Seville, **Thundercloud electrification in relation to rain and snow particles.** (In: **Thunderstorm electricity.** Chicago, Univ. of Chicago Press, **1953.** p. 207–230. 6 figs., eqs., refs. p. 228–230.) Also his: **Hydrometeors and thunderstorm electricity.** *Ibid.*, Oct. **1950.** p. 149–169. 2 figs., table. **DWB**—Four kinds of experimental procedures for investigating the electrification of the atmosphere by hydrometeors are described. These include the raindrop tube experiment which involves the disruption of drops in a vertical current of air; the snow meter for measuring the charge of falling snowflakes, radio sounding in thunderclouds and snow, and measurement of electric field during snowstorms by means of a corona point. Diagrams of the raindrop tube and snow meter are included. *Subject Headings:* **1. Thunderstorm electricity 2. Electrical charges on drops 3. Precipitation electricity measurement.**—*I.L.D.*

6F–364 551.574.1(08)

†Colloquium on Microwave Meteorology, Aerosols and Cloud Physics, McGill University, Sept. 1950, **Proceedings.** Ralph J. Donaldson, Jr. (*ed.*). *U. S. Air Force, Cambridge Research Center, Geophysical Research Papers*, No. 13, May **1952.** 123 p. 32 figs., refs. **DWB**—The purpose of the Colloquium held at Montreal, Canada, on Sept. 18–19, 1950 under the auspices of U. S. Air Force Cambridge Research Center, was to assemble the various groups conducting research on the physics of clouds and precipitation under sponsorship of the Research Center and also to sum up present knowledge on several aspects of cloud physics, especially the growth and distribution of water droplets. The Procedings contain illustrated text of lectures and discussions. The individual papers will be dealt with separately. (*Same item as* 4.11–200, Nov. 1953, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Symposia. I. Donaldson, Ralph J., Jr.,** (*ed.*).—*G.T.*

6F–365 551.509.67(08)(52)

Committee for Rain-making in Japan, Tokyo (c/o *Met. Res. Inst., Tokyo*), **Report of rain-making in Japan,** vol. 1, **1954.** 159 p. +2 reprints. photos., diagrs., tables, refs. All in English. **DWB**—A nice collection of nearly a score of reports and scientific papers read at a symposium held in Tokyo in the autumn of 1953. The Committee on Rain-making in Japan was organized in the spring of 1952 by academic and government meteorologists and technicians of the electric power companies

see if some way could not be found to relieve situations such as occurred in 1951 when rainfall was scarce all over Japan that needs for power could not be met. Rain-making experiments were egun in 1951. Since 1952 meetings of the Committee have been held twice a year to discuss results experiments and plan future work. Papers on cloud seeding and cloud physics are listed in art III, *MAB* Contents p. 886 and analyzed separately. *Subject Headings:* **1. Rain making symosia 2. Cloud physics 3. Japan.**—*M.R.*

6F–366 551.574.25

Falconer, Raymond E., **A possible relationship between the sign of the potential gradient nd the type of particles in a cloud.** (In: Schaefer, Vincent J., **Final Report, RL-1007, on Contract onr-925(00), with General Electric Research Laboratory, Schenectady, N. Y.,** Dec. **1953.** p. 97–03. fig., 9 refs.) **DWB**—In support of the hypothesis that there is a relation between the sign nd magnitude of potential gradient and the change in state of water in clouds during storms, the uthor refers to earlier literature from which it appears that (1) positive fields are usually associated ith cold temperatures and (2) negative fields with warmer temperatures. During the passage of ccluded fronts or squall lines, fields of alternating sign are usually observed. *Subject Headings:* **Electrical charges on drops 2. Thunderstorm electricity 3. Ice crystal formation.**—*G.T.*

6F–367 551.594.25 551.508.94

†Gunn, Ross (*U. S. W. B., Wash., D. C.*), **Measurements of the electricity carried by precipitation articles.** (In: **Thunderstorm electricity.** Chicago, Univ. of Chicago Press, **1953.** p. 193–206. figs., table, refs. p. 205–206.) **DWB**—Instruments for measurement of electric charges in thunderouds by aircraft, many of them devised by the author, and results of measurement of free charges n drops during thunderstorms as well as laboratory experiments on charges generated by freezing drops are discussed and illustrated. Data from thunderstorm of July 24, 1945 records obtained flight and calculations of integrated effects of changes are also presented. (*See also* 3.8–223, ug. 1952, *MAB.*) *Subject Headings:* **1. Thunderstorm electric charge measurement 2. Air-borne ectric charge instruments 3. Electrical charges on drops.**—*M.R.*

6F–368 551.594.25:629.13

Gunn, Ross (*U. S. W. B., Wash., D. C.*), **Precipitation electricity.** (In: **Compendium of Meorology.** Boston, American Meteorological Society, **1951.** p. 128–135. 2 tables, 29 refs., 8 eqs.) **MH-BH**—The most recent observations by the author and others, on the charges on various types raindrops (quiet, shower and thunderstorm rain), on snow and on cloud elements, show the eneral pattern of sign and intensity of charges on various types of particles acting in various ways. here are many contradictions in past observations and resulting theory, but the causes of some of ese variations in charge can now be explained. The processes responsible for such charges are ivided into *basic processes* (frictional), freezing, chemical, and the "waterfall effect" or breaking p process and *environmental processes* (selective capturing of charges by falling drops, rime deposion, and water vapor transfer) and *association processes.* The theory of free electrical charges, the nportance of droplet size in determining the sign and degree of charge, and finally, the electrification aircraft flying through precipitation are treated. Quantitative values for charges on various rop sizes and types, and for the electric field around such drops, according to various authors, are ven in brief tables to show the order of magnitude of such charges. The charges produced by ow on airplanes, especially at very low temperatures, are more important than those produced in ying through thunderstorms because in the former case the effect is more prolonged (hours) comared with that of the latter (minutes). Results of investigations on charges produced on military ircraft in Alaska and elsewhere, and published in detail in reports of the **Precipitation Static Project,** re briefly reviewed. (*Same item as* 4.2–8, Feb. 1953, *MAB.*) *Subject Headings:* **1. Electricity of recipitation 2. Electrical charges on drops 3. Precipitation static 4. Aeronautical meteorology.** —*M.R.*

6F–369 551.574.1:551.575:551.578.71

†Houghton, Henry G. (*M.I.T.*), **On the physics of clouds and precipitation.** (In: **Compendium f Meteorology.** Boston, American Meteorological Society, **1951.** p. 165-181. fig., 4 tables, 8 refs.) **MH-BH**—A thorough and lucid discussion of the particular phase of physical meteorology vhich deals with the physical processes of natural (as distinguished from artificial) condensation and recipitation. The source, physical and chemical properties, size and frequency distribution, and ole of condensation nuclei in the initial phase of condensation; the growth of cloud drops; the nethods of measurement of drop size and liquid water content, and data from such measurements; he physical processes of supercooling of water and water vapor, condensation and sublimation elow 0°C, precipitation mechanisms, processes of snow, hail and ice cloud formation, size of rainrops and, finally, the artificial dissipation of fog are taken up in successive chapters or paragraphs. The most important literature on these subjects is included in the excellent bibliography, and the

contributions of various authors in each field are cited and evaluated historically. Three method of artificial fog dissipation are described (heating, desiccation and use of charged sand). The fir two methods actually require about ten times as much energy as the theoretical minimum. Furthe research is needed to reduce this uneconomical factor. Also knowledge of the ice phase, of the ro of freezing and sublimation nuclei, and of the growth of drops by collision in a gravitational fiel which can be studied intensively in the laboratory and in the free atmosphere, are reviewed. (*Sam item as* 3.11–4, Nov. 1952, *MAB.*) *Subject Headings:* **1. Cloud physics 2. Fog dissipation 3. Ha formation 4. Ice phase.**—*M.R.*

6F–370 551.576.11:551.574.

Kriestanov, L., **Vierkhu edin sluchaĭ na ugolemiavane na oblachni kapki chrez slivan** [Growth of cloud droplets by coalescence.] *Bulgarska Akademiia na Naukite, Sofia, Izvestiia Seriia Fizicheska*, 1:196–201, Jan./Dec. **1950.** 5 refs., 14 eqs. In Bulgarian; Russian and Englis summaries p. 202–203. **DLC**—The mechanism of growth of relatively large water droplets coalescin with smaller droplets, while falling in a cloud, has been examined on the basis of the dynamic equations of MESTERSKI for a body with changing (increasing) mass. The resistance of the air ha been accounted for in its most general form as dependent on the drag coefficient C. For C = cons the differential equation for the movement can be integrated exactly and the relation between th velocity, the radius of the droplet and the time is thus obtained. For relatively large droplets $V^2 = \frac{8g\rho w}{7e+3ce} R$; where V is the velocity, R the radius, g-gravity, ρw and ρ the densities of th droplet and the air, e—the water content of the cloud. The time needed for a droplet to grow fro R_0 to R is given by $t = \frac{4\rho w\sqrt{7e+3c\rho}}{e\sqrt{29\rho w}} (\sqrt{R} - \sqrt{R_0})$. (*Same item as* 4.2–195, Feb. 1953, *MAB.*) *Sub ject Headings:* **1. Drop accretion 2. Coalescence 3. Drop velocities 4. Drop size distribution.**— *Author's abstract.*

6F–371 551.578.11:551.574.1:551.558.

Kriestanov, L., **Vierkhu izpariavaneto na svobodno padashchi vodni kapki v atmosferata.** [O the evaporation of droplets falling freely in the atmosphere.] *Bulgarska Akademiia na Naukie Sofia, Izvestiia, Seriia Fizicheska*, 1:204–210, Jan./Dec. **1950.** 3 refs., 24 eqs. In Bulgarian, Russia and English summaries p. 209–210. **DLC**—The dynamical equations of MESTERSKI for a body wit changing (decreasing) mass have been employed in order to determine the relation between th velocity, radius and time for a continuously evaporating falling droplet. The influence of the ai stream on the evaporation has been accounted for by the Lebenson's factor f. For f = const. fo definite intervals of the values of r or v we obtain the following relation between v, r and h, r: 1. Fo a droplet falling in still air:

$$v = \frac{2\rho wg}{9\eta + 2D\Delta Ef} r^2; \qquad h = \frac{\rho^2 wg\,(r_0{}^4 - r^4)}{2D\Delta Ef(9\eta + 2D\Delta Ef)};$$

2. For a droplet falling in air stream moving upward with constant velocity:

$$v = \frac{2\rho wg}{9\eta + 2D\Delta Ef} r^2 \frac{9\eta - 6D\Delta Ef}{9\eta + 6D\Delta Ef}; \qquad h = \frac{\rho w^2 (r_0{}^4 - r_4{}^4)}{2(9\eta + 2D\Delta Ef)D\Delta Ef} - \frac{(9\eta - 6D\Delta Ef)\rho w^w}{2(9\eta + 6D\Delta Ef)D\Delta Ef} (r_0{}^2 - r^2)$$

Here η is the viscosity of the air, D the diffusion coefficient of water vapor in air, ΔE = the humidit deficiency. (*Same item as* 4.2–211, Feb. 1953, *MAB.*) *Subject Headings:* **1. Evaporation of raindrop 2. Drop velocities 3. Drop size distribution 4. Vertical velocities.**—*Author's abstract.*

6F–372 551.574.

McDonald, James E., **Theoretical cloud physics studies.** Iowa State College. Physics Dept. Contract Nonr 757, T.O.(00), Project NR 082 093, Final Report, Jan. 31, **1953.** 105 p. figs. tables, eqs., bibliog. p. i–iv (following p. 105). Mimeo. **DWB**—This report contains 4 studies each complete in itself, including an abstract, summary and suggestions for future research. Th first and longest treatise, entitled **Homogenous nucleation of supercooled water drops,** develops th theory needed to explain the spontaneous freezing of supercooled water drops at −38°C to −41°C as distinguished from heterogeneous freezing at higher temperatures, such as is found on aircraf flying through supercooled clouds, or in artificial nucleation of clouds. The theory gives −26°C as the probable temperature of homogeneous freezing, but this is thought to be close enough t −40°C to verify the theory. The second paper **On the electrical conductivity of the lower strato sphere** discusses the cause of the sudden decrease in conductivity (as evidenced by an increase i field intensity) at 19–22 km discovered in the Explorer II balloon flight into the stratosphere in 1935 This was thought by many writers to be an anomalous occurrence, but the same effect was reporte in 1926 by IDRAC as a result of balloon soundings on one day in June 1926 at Trappes, France. A

ypothesis that this phenomenon is caused by the convective updraft of Aitken nuclei into the tratosphere seems insufficient to produce a uniform increase in nuclei and resulting charged layer hroughout the earth. Further soundings are recommended to shed light on the question. The hird study, entitled **A note on erroneous cloud physical applications of Raoult's law,** shows that a onsistent error of as much as 191% (for NaCl) has been made in estimating the decrease in vapor ressure of cloud drops due to the presence of dissolved substances (cf. Howell 1949 and others). The fourth paper is entitled **The shape and aerodynamics of large raindrops.** The physical factors f surface tension, hydrostatic pressure, external aerodynamic pressure, electrostatic charge and nternal circulation which might control shape of large raindrops are discussed and the conclusion eached that the first 3 are the only important factors in producing deformation. A single but xcellent drop photograph obtained by C. MAGONO of Hokkaido Imperial University (furnished by J. NAKAYA) is used to calculate forces and test theory. Numerous schematic diagrams and derived lata are presented to show that separation of airflow around a drop affects its shape and hence the hysical processes around the drop when falling. (*Same item as* 4.11-3, Nov. 1953, *MAB.*) *Subject Headings:* **1. Cloud physics research 2. Spontaneous freezing 3. Electrical conductivity in stratosphere 4. Condensation nuclei 5. Raindrop distortion.**—*M.R.*

6F–373 551.578.11

Mason, B. J. (*Imperial College, London*), **The production of rain and drizzle by coalescence in ayer clouds.** *I.U.G.G., Association of Meteorology, 9th, Brussels, Aug.* **1951,** *Procès-Verbaux des Séances, Mémoires et discussion,* pub. Brussels, **1953.** p. 140–141. **DWB.** Its *AIM* No. 9/c. Also issued as: *Uppsala Universitetet. Meteorologiska Institutionen, Meddelande* No. 39. **DWB**— A discussion of the relative importance of collision and resultant coalescence of cloud droplets in the elease of drizzle and rain, based upon data on stratiform clouds given by aircraft ascents, thrice laily during 1942–44 at Aldergrove (North Ireland). The relationship between cloud temperatures nd rain occurrence and the maximum size to which a drop can grow by coalescence are considered. t is concluded that coalescence can produce only very small raindrops unless the cloud is considerably hicker than 10,000 ft so that the cloud top is always colder than −10°C. *Subject Headings:* **1. Raindrop coalescence 2. Cloud droplets 3. Aldergrove, Ireland.**—*I.L.D.*

6F–374 551.574.1

Naik, Y. G. (*Gujarat College, Ahmedabad*), **Correlation between optical and dynamic methods of neasuring size of water drops in a cloud.** *Journal of Colloid Science,* N. Y., 9(5):393–399, Oct. **1954.** ig., 2 tables, 23 refs. **DLC**—A comparison of the theory of the diffraction rings observed in a cloud by transmitted light is made with the Mie theory. The values of the radii determined experimentally on the bases of the two theories are compared with those obtained from the dynamic method using STOKES' and CUNNINGHAM's equations. It was found that the diffraction theory gives values of radii which agree with those obtained from CUNNINGHAM's equation for drops of radii varying from 1 to 5μ. *Subject Headings:* **1. Drop size measurement 2. Solar coronas.**—*Author's abstract.*

6F–375 551.573:551.578.11

Ogiwara, S., **Evaporation of rain drops. (Studies of evaporation, Pt. 4.)** *Meteorological Society of Japan, Journal, Ser.* 2, 25(1/3):1–11, Jan./March **1947.** 5 figs., foot-refs., eqs. In Japanese; English summary p. 45. **DLC**(Orientalia, Japanese)—The author intended to get a theoretical formula expressing the rate of evaporation of falling rain drops. Applying the theory of boundary layer on the falling raindrop, we obtained a formula for the evaporation from the region between the forward point (i.e. dynamically stagnant point) and the separation point of the drop: viz. $M' = 0.205 \times 4\pi ka\sqrt{R}(Co - C\sim)$; where k, diffusion coefficient of the water vapor through air: a, radius of the drop; R, Raynolds number of the drop for the rate of fall; Co, $C\sim$, water vapour density (g/cm³) on the surface of the drop and in the air respectively. The flow in the wake of the drop is so complicated that we could not get the rate of evaporation from this region. So comparing with FRÖSSLING's experimental formula we have the formula $M = 0.233 \times 4\pi ka\sqrt{R}(Co - C\sim)$ for the rate of evaporation of falling rain drops. Comparing this with the results for cloud and fog particles which were obtained by the author in **Studies on Evaporation, Pts. 2 and 3,** the rate of evaporation of water drops in the case of $Co - C\sim = 1$ is illustrated diagrammatically. *Subject Headings:* **1. Evaporation of raindrops 2. Evaporation theory.**—*From author's abstract.*

6F–376 551.594.25:551.574.1:551.515.41

Shishkin, N. S., **O zariade kapel' v grozovykh oblakakh.** [On the charge of drops in thunderclouds.] *U.S.S.R. Glavnoe Upravlenie Gidrometsluzhby, Informatsionnyi Sbornik,* 1:47–54, **1951.** 5 figs., 8 refs., 17 eqs. **DLC**—Calculation of the coagulation charge of drops in a polydisperse cloud with an ascending stream. The primary stage in drop growth is attributed to water vapor condensation. The development is very quick at the outset and slows down with increasing drop size.

After reaching a size near 20μ the further growth is much affected by coagulation. The calculations made by the author show the most rapid growth of the drop charge in the layer 600–1200 m above the base of the cloud, when the speed of the ascending stream is 1 m/sec. Charges of the order of 10^{-} GGSE are obtained at the height of 2.5–3.5 km over the cloud base (3.4–4.5 km above the ground surface). While falling from this height to 1 km above the cloud base, the charge of the sizable drops and the speed of their growth increase rapidly. Therefore the author considers this layer as the most probable area of the origin of thunderstorm electrical phenomena. The freezing of drops does not essentially change the results. A brief summary of measurements made from airplane by Ross Gunn (*Physical Review*, 71:181, **1947**) concludes the paper. (*Same item as* 4.5–232, May 1953, *MAB.*) *Subject Headings:* **1. Drop charges 2. Thunderclouds 3. Drop growth 4. Thunderstorm electricity. I. Gunn, Ross.**—*N.T.Z.*

6F–377 551.574.1

Warum halten sich Wolken und Nebel langere Zeit? [Why do clouds and fog persist for long periods?] *Umschau*, 54(7):214, April 1, **1954. DWB**—Refers to paper by W. A. Weyl, *Journal of Colloid Science*, 6(5):389, **1951.** Persistence is attributed to negative charge on surface of water drops due to O^{--} ions of H_2O molecules. *Subject Headings:* **1. Cloud physics 2. Stability of clouds. I. Weyl, W. A.**—*C.E.P.B.*

6F–378 551.509.67:551.578.7

Beck, F. X., **Hagel-Abwehr.** [Hail protection.] *Umschau*, 55(13):404–406, July 1, **1955.** 4 figs., 2 refs. **DLC**—A sketch is given of the formation of hail in a cumulonimbus. Prevention is by the introduction of condensation nuclei (AgI) which inhibit excessive supercooling. Airplanes and surface generators do not take them high enough, but rockets can penetrate the supercooled region and are simple and cheap. Early recognition of a dangerous cloud is essential; this can be by radar and by warnings from a central office. *Subject Heading:* **1. Hail prevention.**—*C.E.P.B.*

6F–379 551.574.1:551.594.2:551.521.64

Cosmic rays charge rain. *Science News Letter*, Wash., D. C., 67(19):302, May 7, **1955. DLC**—Report of Ross Gunn's theory of electrification of clouds and raindrops by cosmic rays, which produce an equal number of positive and negative charges on droplets. These charges build up by coalescence of drops, through collision and attraction, and energies are 1,000 to 3,000 times higher during growth of drops than in original charging. Rain from nonfreezing clouds can be explained this way. The theory was explained in paper presented to National Academy of Sciences. *Subject Headings:* **1. Electrification of clouds 2. Cosmic ray action on clouds 3. Cloud physics.**—*M.R.*

6F–380 551.574.1

Reynolds, S. E. (*New Mexico Inst. of Tech.*), **Cloud physics—a review.** (In: Conference on Radio Meteorology, Nov. 9–12, 1953, Univ. of Texas, **Supplement to the Proceedings,** VI-2, pub. **1954.** 8 p. fig., 29 refs.) **DWB**—A concise and competent review of the current status of knowledge in cloud physics. Discussed in particular are: Bergeron-Findeisen theory of cloud drop formation; cloud seeding techniques of Project Cirrus and other rainmaking experiments; rain from nonfreezing clouds; Houghton's calculations of precipitation-particle growth; drop size spectra derived by Howell, Kraus-Smith, Woodcock-Gifford, etc. The author warns against concentrating on warm-cloud precipitation and stresses the importance of thoroughly investigating the ice-crystal phase in the development of droplets. *Subject Headings:* **1. Cloud physics 2. Review articles.**—*G.T.*

6F–381 551.594.25:551.576.1

Webb, Willis L. and Gunn, Ross, **The net electrification of natural cloud droplets at the earth's surface.** *Journal of Meteorology*, 12(3):211–214, June **1955.** 3 figs., 3 tables, 6 refs. **DWB**—The charges on cloud droplets and on residual air were measured separately on Mt. Weather and Mt. Mitchell by passing cloud through a centrifuge (diagram given) and the air through an ion filter. Data of 15 cases of fog and 19 of young cloud are given. In fog, charge on droplets averaged -1.4 esu/(cc$\times 10^8$) and on residual air $+4.3$. In cloud average was $+1.3$ on droplets and -0.9 on air. The net charge averaged less than one ion per droplet. When traces of rain were present charges were much larger and more variable. *Subject Heading:* **1. Electrical charges on cloud droplets.**—*C.E.P.B.*

6F–382 551.574.1:016

†Shishkin, N. S., **Literatura.** [References.] (In his: **Oblaka, osadki i grozovoe elektrichestvo.** [Clouds, precipitation and thunderstorm electricity.] Moscow, **1954.** p. 274–280. 156 refs.) **DLC**—(For abstract on the textbook *see item* 6F–341 above.) A list of references to Russian and

oreign literature on cloud physics, containing the following Russian items not included in this ibliography:

1. Aderkas, O. IU., **Opredelenie srednego zariada kapel' tumana.** [Determination of the nean charge of the fog drops.] *USSR. Glavnoe Upravlenie Gidromet. Sluzhby, Trudy Nauvhno-ssledovatel'skikh Uchrezhdenii, Ser. I, Meteorologiia* (TRUDY NIU GUGMS, SER. I),vyp. 1, 941.

2. Bazilevich, V. V., **O kondensatsii vodianykh parov v atmosfere.** [On the condensation of vater vapor in the atmosphere.] *Ibid.*, vyp. 1, 1941.

3. Barakan, N. B., **Izmerenie plotnosti ob'emnykh zariadov tumana metodom trekh kollektorov.** [Measurement of density of the space charges of fog by method of three collectors.] *Ibid.*, vyp. 1, 941.

4. Blinov, L. K., **O postuplenii morskikh soleĭ v atmosferu i o znachenii vetra v solevom balanse Kaspiĭskogo moria.** [Intake of sea salt by the atmosphere and the importance of wind in the salt alance of the Caspian Sea.] *Akademiia Nauk SSSR. Institut Okeanologii, Trudy*, vyp. 15, 1950.

5. Borovik-Romanova T., **Pereokhlazhdenie vodianykh kapel'.** [Supercooling of water drops.] *Leningrad. Institut Eksperim. Meteorologii, Trudy*, vyp. 1, 1937.

6. Borovikov, A. M., **Nekotorye rezul'taty izucheniia oblachnykh elementov.** [Some results of the study of cloud elements.] *Leningrad. Tsentral'naia Aerologicheskaia Observatoriia, Trudy*, vyp. 3, 1948.

7. Veinberg, B. P., **Sneg, ineĭ, grad, led i ledniki.** [Snow, hoarfrost, hail, ice and glaciers.] Ob'edinenie Nauchno-Tekhnicheskikh Izdatel'stv, 1936.

8. Vysokovskiĭ, D. M., **Rasseianie i pogloshchenie mikroradiovoln v atmosfernykh obrazo-vaniiakh (dozhd', sneg, oblachnost', tuman) i radiolokatsiia.** [Scattering and absorption of micro-adiowaves in atmospheric formations (rain, snow, clouds, fog) and radiolocation.] *Uspekhi Fizicheskikh Nauk*, Moscow, v. 47, vyp. 3, 1952.

9. Gudris, N. and Kulikova L., **Isparenie malykh vodianykh kapel'.** [Evaporation of small vater drops.] *Zhurnal Obshchei Khimiĭ*, Leningrad, vol. 56, vyp. 2–3, 1924.

10. Deriagin, B. V. and Prokhorov, P. S., **Issledovanie prichin nesliianiia zhidkikh kapel' v staticheskikh usloviiakh (pri dlitel'nom kontakte).** [Investigation of the causes for non-coalescence of fluid drops in static conditions (under continuous contact).] Symposium **Novye metody v oblasti izucheniia aerozolei.** [New methods in the study of aerosols.] Akademiia Nauk, SSSR, 1949.

11. Deriagin, B. V. and Todes, O. M., **Teoriia dvizheniia i rosta kapel' v voskhodiashchem potoke nasyshchennogo ili peresyshchennogo parami vozdukha i ee vozmozhnye meteorologicheskie prilozheniia.** [The theory of movement and growth of drops in an ascending saturated or over-saturated air flow, and its possible meteorological applications.] Akademiia Nauk, SSSR, 1949.

12. Zaĭtsev, V. A., **Raspredelenie iader kondensatsii po vysote v dni s kuchevoĭ oblachnost'iu.** [Distribution of condensation nuclei with height on days with cumulus clouds.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, vyp. 7, 1948.

13. Zaĭtsev, V. A., **Razmery i raspredelenie kapel' v kuchevykh oblakakh.** [The size and distribution of drops in cumulus clouds.] *Ibid.*, vyp. 13, 1948.

14. Zaĭtsev, V. A., **Novyĭ metod opredeleniia vodnosti oblakov i tumanov.** [New method for determining the water content in clouds and fog.] *Ibid.*, vyp. 13, 1948.

15. Zaĭtsev, V. A., **Vodnost' i raspredelenie kapel' v kuchevykh oblakakh.** [Water content and distribution of drops in cumulus clouds.] *Ibid.*, vyp. 19, 1950.

16. Zak, E. G., **Frontal'nye oblachnye sistemy.** [Frontal cloud systems.] *TRUDY NIU GUGMS, Ser. 2, Sinopticheskaia Meteorologiia*, vyp. 14, 1946.

17. Zak, E. G., **Mikrostruktura frontal'nykh oblakov.** [Microstructure of the frontal clouds.] *Meteorologiia i Gidrologiia*, No. 6, 1949.

18. Zamorskiĭ, A. D., **Snezhnye formy osadkov iz zimnikh livnevykh oblakov.** [Forms of snow precipitation from the winter shower clouds.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, vyp. 7, 1948.

19. Zamorskiĭ, A. D., **Sublimatsionnyĭ rost snezhinok.** [Sublimation growth of snow flakes.] *Ibid.*, vyp. 13, 1948.

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23. Kiriukhin, B. V., **Isparenie kapel' vody i vodnykh rastvorov soli.** [Evaporation of water drops and salt solutions.] *TRUDY NIU GUGMS, Ser.* 1, vyp. 7, 1945.

24. Krasnogorskaia, N. B., **Elektronnyĭ umnozhitel' kak pribor dlia izmereniia razmerov chastits osadkov.** [Electronic meter as an instrument for measurement of sizes of precipitation particles.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. i Geof.*, No. 5, 1952.

25. Leĭbenzon, L. S., **Ob isparenii kapel' v gazovom potoke.** [Evaporation of drops in a ga flow. *Ibid.*, t. 4, No. 3, **1940.**

26. Langmuir, I., **Rost chastits v dymakh i oblakakh i obrazovanie snega iz pereokhlazhdennyk oblakov.** [The growth of particles in the smoke and in clouds, and the formation of snow fro supercooled clouds.] *Uspekhi Fizicheskikh Nauk*, Moscow, t. 37, vyp. 3, **1949.**

27. Nikandrov, V. IA., **Opyty s pereokhlazhdennymi kapliami vody.** [Experiments wit supercooled water drops.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, vyp. 31, **1951**

28. Nikandrov, V. IA., **Ob assotsiatsii molekul vodianogo para v atmosfere.** [Association o molecules of water vapor in the atmosphere.] *Ibid.*, vyp. 31, **1951.**

29. Obolenskiĭ, V. N., **Usloviia ustoĭchivosti oblakov i tumanov i usloviia vydeleniia iz nik osadkov.** [The conditions for stability of clouds and fogs, and conditions for the formation o precipitation.] *Meteorologicheskiĭ Vestnik*, Leningrad, No. 2–4, **1931.**

30. Prokhorov, P. S., **Vyiasnenie mekhanizma nesliianiia vodianykh kapel' pri soudarenii** [Clarification of the mechanism of non-fusion of water drops by collision.] Symposium **Novy metody v oblasti izucheniia aerozolei.** [New methods in the study of aerosoles.] Izd. Akademii Nauk, SSSR, **1949.**

31. Prokhorov, P. S., Deriagin, B. V. and Leonov, L. F., **Vliianie vlazhnogo defitsita na skorost koaguliatsii vodnogo aerozolia.** [The effect of saturation deficit on the speed of coagulation of water aerosol.] *Akademiia Nauk SSSR, Doklady*, vol. 81, No. 4, **1951.**

32. Prokhorov, P. S. and Leonov, L. F., **Vliianie vlazhnogo defitsita na protsessy soudarenii i sliianiia vodnykh kapel'.** [The effect of saturation deficit on the processes of collision and fusion of water drops.] *Kolloidnyi Zhurnal*, Moscow, v. 14, vyp. 1, **1952.**

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34. Selezneva, E. S., **O iadrakh kondensatsii v atmosfere.** [The condensation nuclei in the atmosphere.] *TRUDY NIU GUGMS, Ser.* 1, vyp. 7, **1945.**

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36. Selezneva, E. S., **Mikrostruktura oblakov.** [Microstructure of clouds.] *Meteorologiia i Gidrologiia*, No. 2, **1948.**

37. Tverskaia, N. P., **Isparenie padaiushcheĭ kapli.** [Evaporation of a falling drop.] *Leningrad. Gos. Univ., Uchenye Zapiski, Ser. Fizicheskikh Nauk*, vyp. 7, **1949.**

38. Tverskaia, N. P., **Vliianie potoka vozdukha na skorost' isparenііa kapel' vody.** [The influence of air flow on the speed of water drop evaporation.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. i Geof.*, v. 14, No. 2, **1950.**

39. Timofeev, M. P. and Shvets, M. E., **Isparenie melkikh kapel' vody.** [Evaporation of small water drops.] *Meteorologiia i Gidrologiia*, No. 2, **1948.**

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41. Khimach, M. A. and Shishkin, N. S., **Opredelenie effektivnosti soudareniia vodianykh kapel'.** [Determination of the effectiveness of collision of water drops.] *Leningrad. Glavnaia Geofizicheskaia Observatoriia, Trudy*, vyp. 31, **1951.**

42. Chestnaia, I. I., **Mikrostruktura kuchevykh oblakov.** [Microstructure of cumulus clouds.] *Ibid.*, vyp. 7, **1948.**

43. Shifrin, K. S., **Kinetika obrazovaniia osadkov.** [Kinetics of precipitation formation.] *Ibid.*, vyp. 31, **1951.**

44. Shishkin, N. S., **Obrazovanie iacheinykh struktur v sloiakh zhidkosti ili gaza.** [Formation of cellular structures in layers of fluid or gas.] *Uspekhi Fizicheskikh Nauk*, Moscow, v. 31, vyp. 4, **1947.**

45. Shishkin, N. S., **O vzaimosviazi mezhdu molekuliarnoĭ, turbulentnoĭ i konvektivnoĭ teploprovodnost'iu.** [The relationship between the molecular, turbulent and convective heat conductivity.] *Akademiia Nauk SSSR, Izvestiia, Ser. Geogr. i Geof.*, v. 12, No. 5, **1948.**

46. Shishkin, N. S., **Ob obrazovanii iacheek na poverkhnosti snega.** [The formation of cells on the snow surface.] *Vsesoiuznoe Geograficheskoe Obshchestvo SSSR, Izvestiia*, v. 80, vyp. 1, **1948.**

47. Shishkin, N. S., **Issledovaniia protsessa obrazovaniia letnikh osadkov i grozovogo elektrichestva.** [Investigation of the process of formation of summer precipitation and the thunderstorm electricity.] *Uspekhi Fizicheskikh Nauk*, Moscow, v. 45, vyp. 3, **1951.** (For abstract of textbook, *see item* 6F–341.) *Subject Heading:* **1. Cloud physics bibliographies.**

PART III. METEOROLOGICAL ARTICLES APPEARING IN RECENTLY ISSUED PUBLICATIONS

Note: The contents of periodical included in this section are for information only, and will not be listed in the monthly indexes until abstracted. When material is furnished in advance of date of publication, the pagination may be omitted.

ir Pollution Foundation, Los Angeles, Calif., First Technical Progress Report covering Work done in 1954. March 1955.

Hitchcock, Lauren B.: **Introduction,** p. 9–15.
Neiburger, Morris: **Meteorological aspects,** p. 16–27.
Rogers, Lewis H.: **Chemical aspects,** p. 27–30.
Faith, W. L.: **Study of combustion products,** p. 31–38.
Renzetti, Nicholas A.; Rogers, Lewis H. and Neiburger, Morris: **Aerometric study,** p. 39–67.
Hitchcock, Lauren B.: **General statistical data of the Los Angeles Basin,** p. 68–73.
Renzetti, Nicholas; Rogers, Lewis H. et al.: **Physical measurements,** p. 74–86.
Hitchcock, Lauren B.: **Disposal of refuse,** p. 87–88.

merican Meteorological Society, Bulletin, Volume 36, Number 4, April 1955.

Oliver, Mildred B. and Oliver, Vincent J.: **Rainfall and stardust,** p. 147–151.
Sherman, Leon and LaSeur, Noel E.: **Reconnaissance of the "complete hurricane,"** p. 152–158.
Biel, E. R.; Havens, A. V. and Sprague, M. A.: **Some extreme temperature fluctuations experienced by living plant tissue during winter in New Jersey,** p. 159–162.
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Collins, George F.: **Application of meteorological skills in the du Pont Company,** p. 167–170.
Alpert, Leo: **Panama tornadoes,** p. 171–172.
D'Ooge, Charles L.: **Five years of weather observations on the White Mountain Range, California,** p. 172–175.
D'Ooge, Charles L.: **Continentality in the Western United States,** p. 175–177.
Martin, Donald E. and Anderson, Willian C.: **West-wind component chart,** p. 177–178.
Lettau, H.: **Turbulence in the stratosphere,** p. 178–179.
Baum, Werner, A.: **Editorial policies of the Journal of Meteorology,** p. 179–180.
Program of the 138th **National meeting of the American Meteorological Society, June 21-23, 1955, at Pasadena, California, in conjunction with the 36th Annual Meeting of the Pacific Division, American Association for the Advancement of Science,** [with abstracts of papers], p. 181–188.

Number 5, May 1955.

Dickson, Robert R.: **A case study of the jet stream,** p. 195-203.
Frenzen, Paul: **Westerly flow past an obstacle in a rotating hemispherical shell,** p. 204–210.
Edinger, James G.: **On the dispersal of large particles in the atmosphere,** p. 211–215.
Bellaire, Frank R.: **Slow-ascent stadia pibals,** p. 216–219.
Pressman, Jerome: **Diurnal temperature variations in the middle atmosphere,** p. 220–223.
Randall, D. L. and Clark, A. B. J.: **A radio-command-control puffer for studying airflow,** p. 224–227.
Texas radar tornado warning network, p. 234.

Beiträge zur Geophysik, Leipzig, Volume 63, Number 3, 1953.

Knoch, H. G.: **Robitzsch, M.—Der Akklimatisationsvorgang von Standpunkt des Klimatologen aus gesehen,** [Review of Robitzsch—Acclimatization from the view point of a climatologist], p. 250–251.

Volume 64, Number 1, 1954.

Haalck, H.: **Die Gezeiten-bewegungen des festen Erdkörpers und die dadurch für sehr genaue Gravimetermessungen notwendig werdenden Korrektionen,** [Tidal waves of the solid earth and the corrections necessary for precise gravimetric measurements], p. 1–15,

Haalck, H.: **Einige kritische Bemerkungen zur Frage der Analyse gravimetrischer Störungsfelder,** [Critical remarks on the analysis of gravimetric disturbance fields], p. 16–22.

Graf, A.: **Über die Möglichkeit der Aufsuchung von Grund- und Salzwasser-horizonten vermittels induktiver geoelektrischer Methoden,** [Possibility of determining the ground and salt water horizons by means of inductive geoelectric methods], p. 23–82.

Number 2, 1954.

Fanselau, G.: **Vorläufiger Bericht über die Beobachtungen am Adolf-Schmidt-Observatorium für Erdmagnetismus in Niemegk in der Zeit vom 1. September 1952 bis 31. August 1953** [Preliminary report on observations at the Adolf-Schmidt-Observatory of Terrestrial Magnetism at Niemegk, September 1, 1952 to August 31, 1953], p. 95–107.

Angenheister, G.: **Registrierungen erdmagnetischer Pulsationen, Göttingen 1952/53,** [Record of geomagnetic pulsations, Göttingen 1952/53], p. 108–132.

Reviews:,

Knoch, H. G.: **König, W.—Grundzüge der Meteorologie,** [Fundamentals of meteorology] p. 141.

Rische, H.: **Zeitschrift für Geophysik. Sonderband aus Anlass des dreissig-jährigen Bestehens der Deutschen Geophysikalischen Gesellschaft,** [Zeitschrift für Geophysik. A special issue celebrating the 30 years of the German Geophysical Society], p. 141–142.

Knoch, H. G.: **Götz, F. W. Paul—Klima und Wetter in Arosa,** [Climate and weather in Arosa] p. 144.

Number 3, 1954.

Belluigi, A.: **Sui campi geoelettromagnetici normali attivati da sistemi galvano-induttivi e induttivi,** [The normal geoelectro-magnetic field activated by galvano-inductive and inductive systems], p. 147–155.

Junge, Christof: **Bai-Untersuchungen am Geophysikalischen Observatorium Collm,** [Bay investigations at the Geophysical Observatory of Collm], p. 173–193.

Graff, Anton: **Vergleich von Präzisionsbarometern untereinander im Hinblick auf barometrische Höhenmessungen,** [Comparison of precision barometers with regard to barometric altimetry], p. 214–222.

Committee for Rain-Making in Japan, Tokyo, Report of Rain-Making in Japan, Volume 1 1954. pub. 1954.

Kobayashi, T. and Okita, T.: **General survey of studies on artificial precipitation in Hokkaido District,** p. 3–7.

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